AVIATION WEEK

A McGRAW-HILL PUBLICATION

JULY 4, 1955

50 CENTS

The Never Ending Watch

To assist the mission of the U. S. Navy, Convair has created a new weapons system, featuring water-based designs that can be used to lend mobility and dispersion of force . . . that can become a forward area striking force without advance preparation of bases.

Only Convair has designed, produced, and flown a water-based jet fighter, a turboprop water-based logistic transport, and a vertical-take-off fighter that can operate from the smallest ships of the fleet!

These new concepts will aid our Naval Air Arm in *the never ending watch* to help maintain general sea supremacy, and air superiority in all areas of naval operations.

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Douglas YC-124B powered by four 5550 h.p. Pratt & Whitney T-34 turboprop engines.

How the Holley "hidden co-pilot" does two jobs with one handle control

Throughout the entire operational range of the new Douglas YC-124B, engine power and propeller governor setting must be precisely coordinated. This has always been a "two-handle" job but in this new airplane the job is done with a single control lever and the help of a Holley Power Control which functions like a "hidden co-pilot".

One of these controls installed on each 5550 horsepower Pratt & Whitney Aircraft T-34 engines automatically senses altitude, air temperature and speed and feeds the information to its nerve center —a series of precision manufactured 3-dimensional cams. These cams continuously interpret this information in terms of engine power which is automatically adjusted through precise metering of fuel by the control.

The Holley Power Control not only coordinates the engine and propeller for all forward thrust conditions but also controls the vital reversing of thrust necessary to reduce the aircraft's landing roll.

Designed, developed and manufactured by Holley, the "hidden co-pilot" is dependable, easy to service, compact and lightweight—four qualities that always distinguish Holley aviation equipment.

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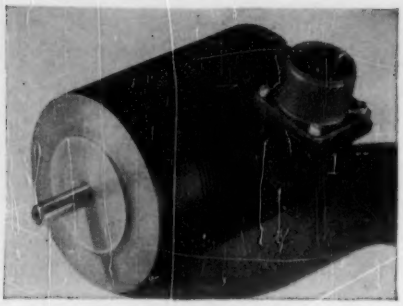

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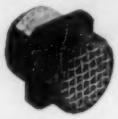

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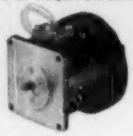

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Aviation Week

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Washington 4, D. C.—National Press Bldg., Phone National 8-3414
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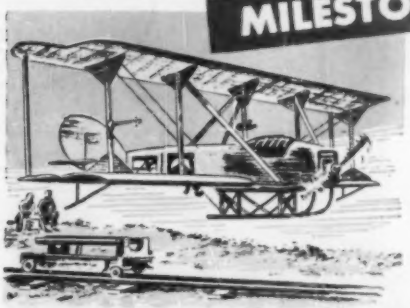
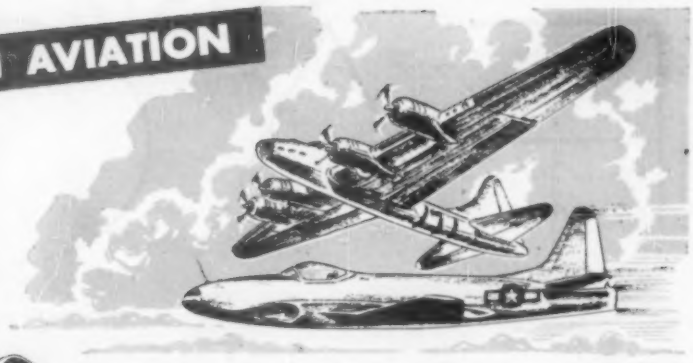
Phillips 66
PRESENTS

MILESTONES IN AVIATION



The ancestor of the guided missile was the aerial torpedo developed by the U. S. Navy and Sperry in 1916-1918.

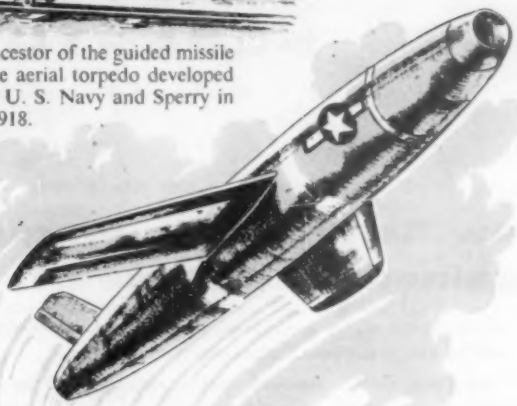


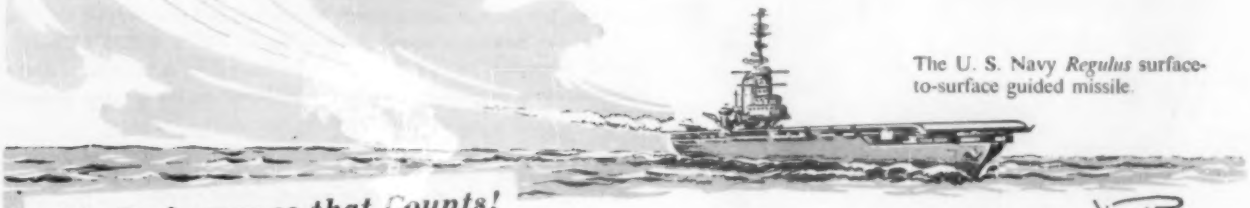
Empty Cockpits

The amazing progress of science, electronics, radio and radar has brought us a new breed of aircraft called "Drones"—full-sized jet bombers and big four-engined bombers, flying at sonic speeds with *empty cockpits.*

Without a single human being aboard, these planes can take off, fly, perform intricate maneuvers, and land. But every move of these super-robot aircraft is controlled by human brains and hands, from the ground or from a "director" plane—either nearby or surprisingly far away.

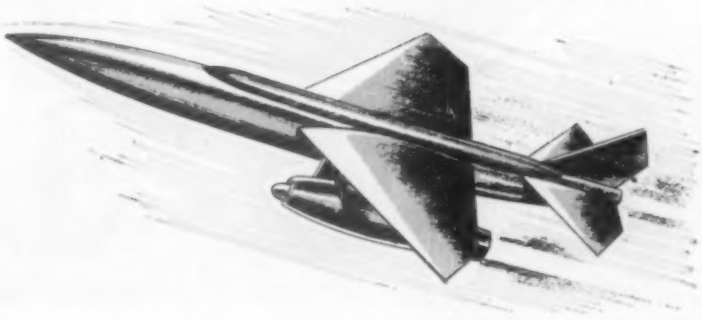
So here is another milestone in aviation—*guided missiles.*





The U. S. Navy *Regulus* surface-to-surface guided missile.

Jim Ray



The *Bomarc IM-99* long range pilotless interceptor missile.

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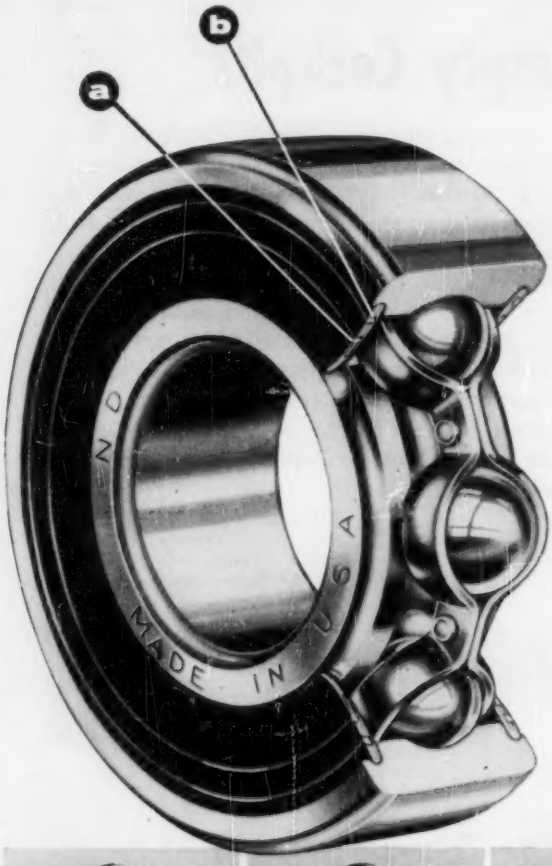
NEW DEPARTURE

BALL BEARINGS



New Sentri-Seal...on guard against dirt and wear!

The unique design of the Sentri-Seal gives optimum protection against dirt, and includes a number of other major advantages.

Sentri-Seals are quickly removed, easily replaced. As the seal is of synthetic rubber, in which two metal rings are embedded, a constant-rate spring is created between the rings. Inherent flexibility prevents distortion of the bearing outer ring due to seal insertion, permitting the use of bearings to the higher accuracy specifications. The spring action maintains an efficient sealing contact with the bearing ring to bar dirt and retain lubricant. Sentri-Seals are relatively inert to oils and greases and operate satisfactorily through a temperature range of −40°F to 225°F. Specifications available for still higher temperatures. In applications where relubrication is desired, it is easily accomplished by the injection method.

The New Departure Sentri-Seal basically consists of two separate metal rings, "A" and "B", embedded in synthetic rubber, resulting in a spring which absorbs distortion and deflection. The seal is not drastically influenced by axial displacement due to bearing end-play within prescribed tolerances, and provides efficient sealing at low torque. Bearing shown is equipped with two seals.

ONE SENTRI-SEAL

SEAL AND SHIELD

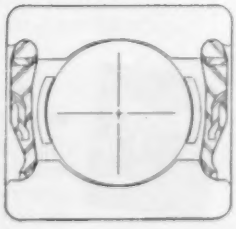
SEAL AND SNAP RING

TWO SEALS AND SNAP RING

SEAL, SHIELD AND SNAP RING

The diagram shows in section the New Departure Sentri-Seal. Lip contacting surfaces are form-ground simultaneously with the ball race, giving an extremely high degree of concentricity between sealing surfaces and the raceway.

Sentri-Seal is available for a range of sizes in single-row, standard-width bearings and also in two types of New Departure adapter bearings. Sizes, dimensions and capacities are listed in the latest New Departure catalog.



Write for full details on Sentri-Seal

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NEWS DIGEST

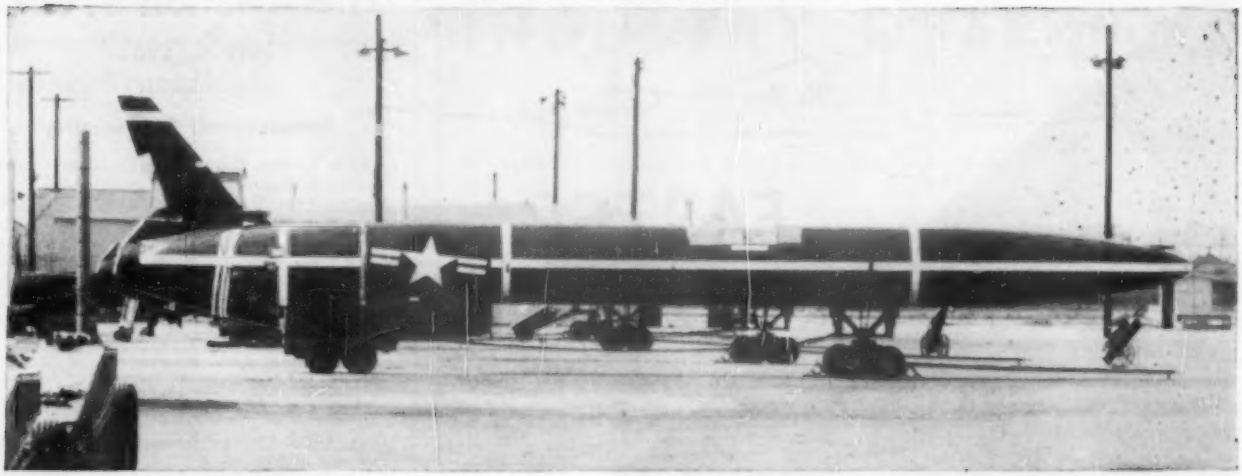

PHOTO SHOWS SNARK MISSILES parked outside the Northrop Aircraft, Inc., plant at Hawthorne, Calif. Wings and movable tail control surfaces have not yet been attached to these missiles. Note jet engine air inlet at rear and underside of fuselage. Photo was taken for Aviation Week by William Clinkscales from Broadway Ave., a public thoroughfare. Snarks have been parked in this area exposed to public view through a wire mesh fence for over a year. They are visible also to private pilots using adjacent Hawthorne public airport. Defense Department says external pictures of Snark are unclassified but refuses to release any. White lines on missile's fuselage aid photography of Snark during flight testing at the U. S. Air Force Long Range Missile Test Center, Cape Canaveral, Fla. Cover on top of fuselage is where sweptback wing is attached. Main center section of fuselage contains fuel to give Snark a 5,000-mi. range.

Domestic

Martin TM-61 Matador missiles were test-fired in the Libyan desert by the 69th Pilotless Bomber Squadron last month during a tactical exercise that involved airlift of the squadron and all equipment from Bitburg, Germany to Wheelus Field, Tripoli.

Dan rocket, upper air research vehicle, has been fired to about 70 mi. altitude at Wallops Island, Va., for Air Research & Development Command. Dan is a two stage, solid propellant system made up of the Deacon rocket and Nike booster. Program calls for obtaining accurate measurements of atmosphere up to 100 mi. altitudes.

Convair TF-102A trainer side-by-side two-seater version of delta-wing all-weather fighter, has been ordered into production at San Diego. Official press release on the TF-102A confirms Aviation Week's report of this project Mar. 29, 1954, p. 11.

Secret atomic energy project is scheduled for completion this month by Fairchild Engine Division, Mineola, N. Y., involving design and construction of "intricate two-stage centrifugal compressor, for which there was a limited requirement." Unit will process an undisclosed substance "absolutely intolerant" of dust, oil and other foreign matter, Fairchild says. Contract value: $40 million.

Brig. Gen. Thomas P. Gerrity, USAF director of Procurement and Production, has been nominated by President Eisenhower for promotion to major general. In the same list to Congress the White House nominated Col. Robert L. Scott, Jr., present chief of USAF public information, to brigadier general.

Rheem Manufacturing Co., Downey, Calif., will build F-100 Super Sabre tail assemblies, ailerons, flaps, wing tips, leading edges and slats for North American Aviation, Inc. Contract exceeds $6 million.

Transocean Airlines will make over 100 trans-Atlantic charter flights in July and August, carrying student, church and various other travel groups at a roundtrip rate of $300 per passenger.

Financial

Merger of Stromberg-Carlson into General Dynamics Corp. has been approved by stockholders of both companies. S-C's consolidated net sales last year totaled $63,509,429. Consolidated net income was reported at $2,006,526.

Ramo-Wooldridge Corp. concluded $20-million financial arrangement with affiliate, Thompson Products, Inc. The West Coast electronics firm plans a new manufacturing plant in the Midwest and enlargement of present Los Angeles facilities. Key employes now control Ramo-Wooldridge, but Thompson has stock options rights under the agreement that could increase its interest in the firm to 84%.

Glenn L. Martin Co. declared a 75-cent dividend to be payable July 28 to all stockholder of record on July 8.

Solar Aircraft Co., San Diego, reports $2,073,000 net profit for the year ended Apr. 30, after provision for federal taxes and refunds. Net after taxes in Fiscal 1954 was $2,048,000. Gain was made despite slip in sales to $63,915,000 compared with 1954's $65,062,000. Backlogs as of Apr. 30: $37,573,000.

International

Indian Air Ministry indicates that it is interested in procuring 80 Dassault Mystere sweptwing fighters, according to a report to Aviation Week from New Delhi. Also under consideration is the lightweight Folland Gnat fighter, but since the IAF has three Dassault Ouragon jet fighter squadrons in service, it is felt the Mystere has the edge in future orders.

Five Vickers Viscounts have been ordered by Indian Airlines Corp., New Delhi for delivery in 1956. IAC also is getting three Douglas DC-4s that are scheduled for use on night airmail services.

Loan of $1.25 million will help Rutas Areas Sam, Colombian Airline, purchase two DC-4s and three DC-3s for planned domestic services. RAS, formerly Sociedad Aeronautica de Medellin, is getting technical assistance from KLM Royal Dutch Airlines.

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WHO'S WHERE

In the Front Office

Cedric Turner, chief executive, Qantas, Australian international airline. **Sir Hudson Fysh** has relinquished his post as chairman and managing director, but continues as board chairman.

Earle M. Jorgensen, member of executive committee of board of directors, Northrop Aircraft, Inc., Hawthorne, Calif.

Peter Cregut, vice president, Western Division, Los Angeles, Gyromechanisms, Inc., Halesite, N. Y.

Richard Hodgson, vice president-general manager, Reconnaissance Systems Division, Fairchild Camera & Instrument Corp., Syosset, N. Y.

Paul L. Benscoter, vice president-Orient Region, Northwest Orient Airlines.

Eugene C. Taylor, assistant vice president-customer service, American Airlines.

William H. Bennett, vice president-sales, Hydraulic Press Manufacturing Co., Mt. Gilead, Ohio. Other changes: **J. W. Arnold,** vice president-manufacturing; **William N. Woodward,** secretary-treasurer; **Robert J. Lindsey,** engineering director and **Glen R. Pittman,** sales manager, Hydraulic Power Division.

Andrew F. Haiduck, executive vice president-manufacturing, and **Chester D. Seftenberg,** vice president-treasurer, Lear, Inc., Santa Monica, Calif.

Adm. Alan G. Kirk, president, Alloy Precision Castings Co., Cleveland, Ohio; **Frank W. Glaser,** vice president-general manager.

Robert L. Boniface, vice president, Neely Enterprises, North Hollywood, Calif., electronics representatives.

Logan Monroe, vice president-controller, Eaton Manufacturing Co., Cleveland, Ohio; **Herbert S. Ide, Jr.,** is new vice president-treasurer.

Honors and Elections

Maj. Reuben H. Fleet (USA, Ret.), founder of former Consolidated Aircraft Corp. and onetime president of the Institute of the Aeronautical Sciences, a Certificate of Appreciation by IAS for his many contributions to the organization.

Jacob Ackeret, professor, Federal Institute of Technology, Zurich, Switzerland, honorary membership in American Society of Mechanical Engineers.

Changes

John R. Moore and **Dr. Robert M. Ashby,** director and assistant director, respectively, North American Aviation's Electro-Mechanical Engineering Dept., Downey, Calif.

John A. Rhoads, Military and Missile Electronics Division manager, Hycon Manufacturing Co., Pasadena, Calif.

Bert W. Holloway, corporate director of advertising, publicity and promotion, Lockheed Aircraft Corp., Burbank, Calif. **Antoine J. Jansen,** technical sales staff, Europe-Africa-Middle East.

Arthur Townhill, engineering director, Harwill Corp., Los Angeles, Calif.

INDUSTRY OBSERVER

(This column was written by Aviation Week editors who attended the Fifth International Aeronautical Conference in Los Angeles.)

► Republic Aviation has initial order for 26 of its F-105s. Plane probably will not fly before next year. Because wing is extremely thin, all fuel is stored in fuselage.

► **First production F-102A now is at Edwards AFB, Calif., for acceptance. As a special precaution the interceptor, heavily loaded with avionic test equipment, was trucked to the air base from Convair's San Diego plant.**

► Requirement specifications for 26-seat turboprop-powered DC-3 replacement will be issued by British European Airways in about three months. While two- and four-engine versions are both being considered, the final configuration probably will embody four small turboprops of about 600 eshp. each. BEA now operates more than 40 DC-3s.

► **Aerodynamic changes made in the Douglas F4D to delay buffet onset by 40 mph. caused a loss of 5 to 10 knots in cruising speed. Douglas considered the buffet gain worth the loss in cruising speed.**

► British European Airways Chief Executive Peter G. Masefield had exploratory talks on the Lockheed Electra and Douglas DC-8 with officials of the two companies during his Los Angeles visit last week.

► **Convair's Sea Dart was given thorough research and development evaluation check at San Diego recently by a Navy Bureau of Aeronautics Patuxent team, which is expected to issue a final report in about three weeks.**

► British view that wing loadings on American military planes have been going up much faster than counterparts on other side of Atlantic is shared by some prominent U. S. designers, who feel that trend has been for these loadings to become excessive. One instance where attention has been given to problem is in F4D, where wing loading is about half that of F3D.

► **Bell Aircraft has been conducting wind tunnel tests on boundary layer control for helicopter rotors. Indications are that such an installation may reduce stall as well as improve control. Despite the complexity, serious study is being given to the idea. Bell also has been test flying rotor blades with a 12-deg. twist for reduction in angle of attack to reduce stalling speed.**

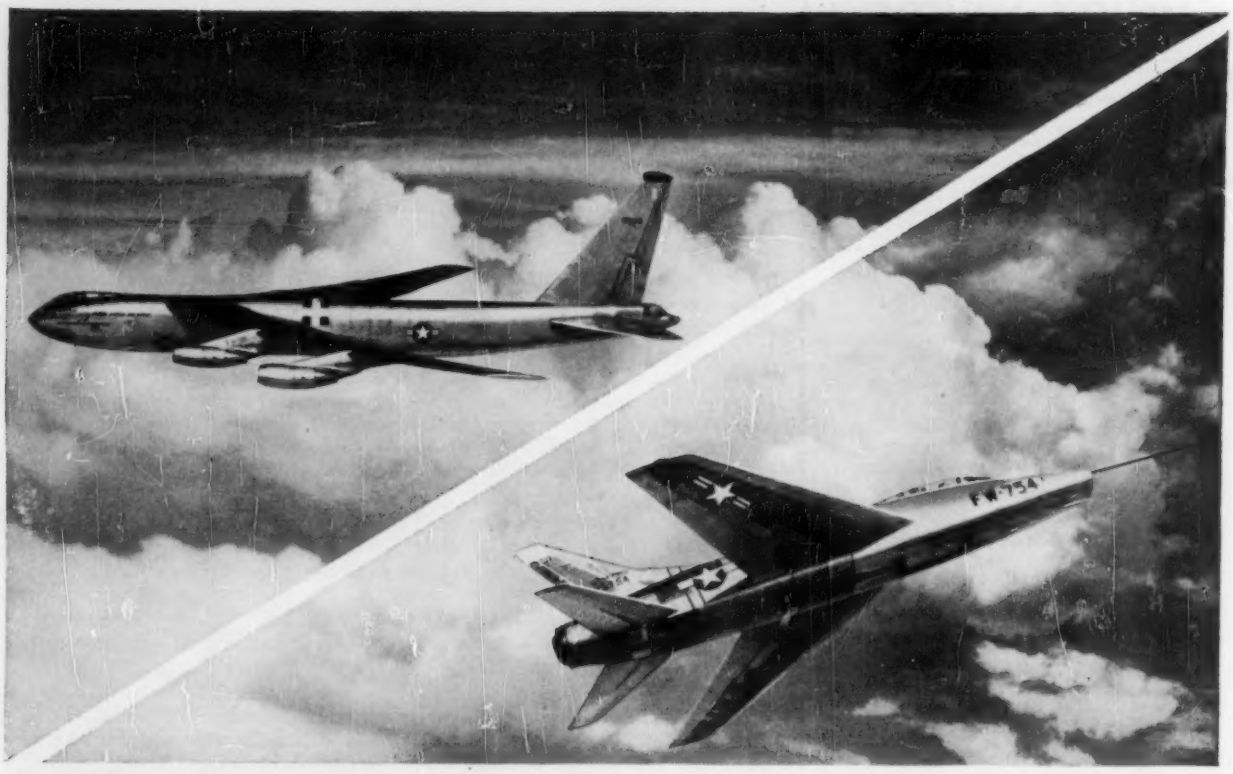
► Northrop Aircraft may engineer and produce under subcontract the entire tail section of Lockheed Aircraft Corp.'s turboprop Electra if negotiations now underway are concluded successfully.

► **Some aircraft designers believe speed of supersonic designs is progressing so rapidly that need for extensive use of titanium will be by-passed entirely in favor of stainless steel and other alloys.**

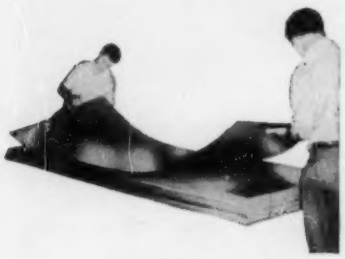
► Airline operators are leaning strongly toward single-point ground refueling in new planes to speed servicing job. Feature likely will emerge in Lockheed Electra turboprop and Douglas DC-8 jet transport. Already in Boeing's KC-135 jet tanker, it probably would be carried over to company's 707 if it is built as commercial jet transport.

► **Development of supersonic piloted-planes will continue simultaneously with missiles for perhaps 15 to 20 years, according to present projections in some design circles. The feeling is that no speed limit on piloted flight is now foreseeable. Detail changes in such items as equipment, lubes and greases will be a continuing necessity, but these are considered easily capable of solution.**

► Handley Page abandoned installation of leading edge slats on its four-engined H.P. 80 Victor bomber because the wing section was too thin to contain the operating mechanism. U. S. aircraft with only a 4½-5% wing thickness have been equipped with leading edge slats.



Rem-Cru titanium is used extensively in such advanced production aircraft as the new North American F-100 Super Sabre and the eight-jet Boeing B-52 Stratofortress.



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Washington Roundup

GM: Top Defense Contractor?

General Motors Corp. is back as the No. 1 defense contractor—under a compilation by Rep. John McCormack, House majority leader.

Since the start of the military build-up in mid-1950, GM consistently figured in Defense Department reports as the company with the largest dollar-volume of defense orders up to Jan. 11, 1954. On that date, Defense discontinued the reports "for economy reasons" until May of this year, when another report was issued at Congressional request (AW May 30, p. 15). But in the May report, GM wasn't even among the 100 largest contractors. The reason: The period covered was July 1, 1953 to Dec. 31, 1954. GM showed up as having a "minus" volume of defense orders.

McCormack's compilation covers the period from July 1, 1950, when the build-up started with the outbreak of the Korean War, to Dec. 31, 1954. It shows GM topping the next largest defense contractor—Boeing Airplane Co.—by a wide margin of almost $2 billion, or over 33%. GM's $7 billion in defense contracts was 6.8% of total defense procurement for period.

On Defense Department's recent report showing GM with a "minus" volume of business, McCormack chided:

"I would think that the former chairman of the General Motors Corp. would have been hurt at this drop in rank and prestige with his well-known economic-political philosophy that 'what is good for what'. When I read that report my heart really went out in sympathy for GM. I could not understand why Charles Wilson as Secretary Wilson should discriminate against this company. But as we view the real statistics, the picture is different."

The nine other top contractors on the list with their percentage slice of total defense business were:

Boeing Airplane Co. $5.2 billion, 4.5%; Douglas Aircraft Co., $3.9 billion, 3.4%; United Aircraft Corp. $3.9 billion, 3.3%; General Electric Co., $3.7 billion, 3.2%; Lockheed Aircraft Corp., $2.9 billion, 2.5%; North American Aviation, $2.8 billion, 2.4%; Curtiss-Wright Corp., $2 billion, 1.8%; American Telephone and Telegraph Co., $1.7 billion, 1.5%; Ford Motor Co., $1.7 billion, 1.4%.

Pentagon Departures

Not since the departure of Roger M. Kyes, first deputy to Defense Secretary Charles E. Wilson, have impending top personnel changes created so much speculation as the forthcoming departures of Roger Lewis and Robert B. Anderson, two highly-regarded Pentagon executives.

Lewis, Assistant Secretary of the Air Force for Materiel, will neither confirm nor deny reports that he is resigning in September. He told AVIATION WEEK his plans are not final, and he believes they should not be discussed at this time. He is expected to leave after Wilson and Air Force Secretary Harold E. Talbott find a successor for his hard-to-fill position.

Anderson, Wilson's deputy, is leaving and presents an enigma to both the press and the Administration. Educated guesses that he will go back to his $60,000 a year job as manager of the Waggoner Estate, a Texas empire, lost credence by the revelation in a Washington newspaper society page that Mrs. Anderson wants to sell their home in Vernon, Tex.

A more likely possibility: The Andersons will move to Houston, from where he can take up his career as a Democratic politician, seek the Texas governorship. Presumably this would take the 45-year-old executive far away from the Citizens for Eisenhower organization he headed in 1952, along with a lot of Texas Democrats who were in that camp.

Pentagon Switch

With both Congress and the press aroused over Defense Department's attitude on public information, there were signs last week that the Pentagon has started to retreat in its effort to control dissemination of news. Assistant Defense Secretary Robert T. Ross, former Republican Congressman from New York, issued a denial that the department "should or would pass judgment on what is useful or interesting." (AW June 27, p. 13).

The Ross stand was taken in a letter to Sen. Carl T. Curtis (R.-Neb.) who had written that "some of my friends in the working press" were concerned by policy statements being issued by R. Karl Honaman, public affairs deputy to Ross.

Earlier, it was announced that a special government information subcommittee, headed by Rep. John Moss (D.-Calif.), plans to investigate thoroughly the whole field: The flow of government information to trade and other private organizations, as well as the press; policies among executive agencies; and policies of executive agencies on furnishing information to Congress.

In appointing Moss, Chairman William Dawson of the House Government Operations Committee, said that it should be determined whether there is unjustified "withholding or suppressing" of information. Other members of the special subcommittee are Rep. Dante Fascell (D.-Fla.) and Rep. Clare Hoffman (R.-Mich.). The investigation has been under consideration for some time, but Defense Secretary Charles Wilson's new information policies added fuel to the fire.

Scheduling Row

Air Line Pilots Assn. and Civil Aeronautics Board are rowing over realistic flight scheduling. Friction stems from the disputed nonstop operations of United Air Lines, Trans World Airlines and American Airlines.

ALPA President C. N. Sayen has supplied CAB Chairman Ross Rizley a chronology of action from February 1954 to May 1955. Sayen says the record reveals "An Alice in Wonderland story of a problem caught in the bureaucracy of the Board with no one apparently willing to take the responsibility to represent the public interest on this critical problem." He accuses the Board of failure to establish standards of reliability in airline scheduling.

CAB's answer came in a letter from Compliance Chief Robert L. Griffith to Sayen in which he expressed "surprised indignation." Griffith pointed out that ALPA could have filed a formal complaint at any time, but has failed to do so. He pointed out that since inauguration of nonstop service westbound schedules on American have been lengthened 50 minutes, TWA 74 minutes and United 40 minutes.

Griffith told Sayen: "It is understandable that we may not have proceeded as you would have had us proceed, and I can assure you that we have not proceeded as the carriers would have had us proceed." He said the judgment of his office has been directed toward the public interest.

—Washington staff

AVIATION WEEK VOL. 63, NO. 1
JULY 4, 1955

NACA Tackling Hypersonic Problems

By William Coughlin

Moffett Field, Calif.—Problems blocking the development of intercontinental ballistic missiles and hypersonic aircraft—aerodynamic heating, stability and control—are now subjects of a major research effort by the National Advisory Committee for Aeronautics.

NACA spelled out these problems in detail and the research efforts aimed at their solution last week before industry, military and press representatives at the Ames Laboratory triennial inspection.

Highlights of the Ames inspection included:

- Briefing on hypersonic flight and its accompanying thermodynamic problems.
- Discussion of dynamic and static stability problems which have been encountered in military and research aircraft already flying.
- Briefing on the B-47 flight test program which NACA has been conducting to study aircraft flexibility.
- Report on the extensive use of analog computers as a basic flight research tool—termed "one of the most significant recent developments" at Ames.
- Report on the unitary wind tunnel facilities which will go into operation at all three of the main laboratory centers of the NACA this year. These tunnels are designed for studies in a speed range from under 550 mph. up to five times the speed of sound.

It was apparent that in many areas the margin between the basic research underway at Ames and the designs on the drawing boards of the industry is becoming extremely narrow.

Solutions Conflict

In some instances the solutions are beginning to conflict. The pointed bodies and sharp wings desirable for hypersonic flight, for example, have been shown to be the least desirable from the standpoint of the formidable problem of aerodynamic heating. Blunt leading edges and surfaces heat up much less rapidly than knife edges.

"Continuing research is bringing a realization that, at even the relatively low supersonic speeds contemplated for tomorrow's airplanes, acrodynamic heating will profoundly aggravate design problems that are already difficult," said Dr. John F. Victory, NACA executive secretary.

Problems of aerodynamic heating will be far more difficult to solve than those of guidance and powerplant, Ames researchers predicted. A promising solution under study is a method of "transpiration cooling," sometimes referred to as "sweat" cooling due to its resemblance to the system which cools the human body. In this method, liquid or gas passes through a porous skin to cool hot boundary layer of air.

NACA studies indicate that such a method would require a flow rate only one-third that of a more conventional internal coolant flow in which the cooling liquid is circulated under the aircraft or missile skin and then dumped overboard.

"Since the coolant must be carried in the aircraft, this is a great advantage," a researcher pointed out.

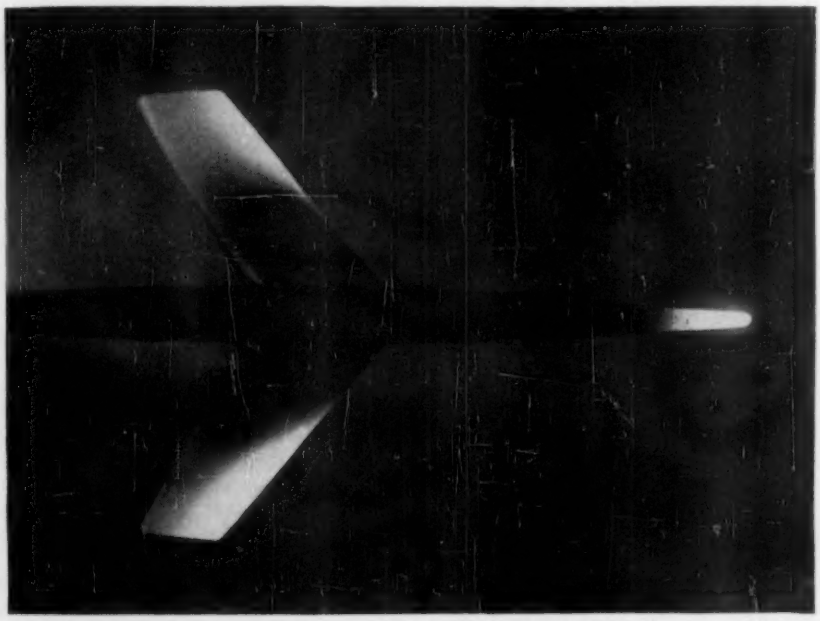
Dynamic Stability

Penetration of new speed regimes, accompanied by radical changes in the shape of aircraft, has had a profound effect on dynamic stability, the committee said. As one example, it cited the trend toward low damping of oscillations at high Mach numbers which is bringing a "new family of troubles."

However, changes in aircraft to improve dynamic stability often penalize the performance of the aircraft so that it cannot achieve the needed speed or range. In some cases, it has been necessary to sacrifice good dynamic stability for good high speed and altitude performance.

Within the last year, several modern aircraft have gotten into serious difficulty during rolling maneuvers, NACA researchers said. "Sometimes when the pilot has attempted rapid rolling, a violent yawing and pitching motion has ensued which was uncontrollable by the pilot," the committee reported. Violence of the maneuver strained the airplanes beyond the safe limits. Changes in weight distribution were blamed for appearance of this problem.

The problem is increased in severity by the fact that it is possible to roll supersonic aircraft fast enough to interact with the yawing oscillation, rolling the aircraft completely around in the time of one cycle of yawing oscillation. With most of the mass distributed along the length of the air-



HEAT BUILDS UP more rapidly on sharp nose and thin wing leading edges of model than on its thicker portions, NACA infra-red photo taken during test in hot gas reveals.

SLOTTED WALLS of NACA-Ames 14-ft. transonic wind tunnel permit airflow disturbances to pass out through the openings while sufficient solid area is retained to guide air uniformly past model. Design is key to tunnel's ability to cover critical near-sonic range.

plane, centrifugal forces set up by the rolling motion tend to swing the nose and tail outward from the roll axis. The aircraft therefore yaws about its center of gravity with an extremely violent motion."

Automatic controls offer one solution to these dynamic stability problems, NACA scientists indicated.

Static Stability

Static stability of supersonic aircraft is being seriously interrupted, NACA reported, by vortex and shock wave interference.

Vortex interference is not limited to supersonic aircraft, an NACA research engineer said, but it is intensified by supersonic designs with slender fuselages and short wings and by the fact that the vortex itself is stronger at higher Mach numbers. Design of shapes and positioning of control surfaces is extremely important, he said, to prevent vortex flows from wings and fuselage interfering with tail surfaces. NACA is developing methods which will permit aircraft designers to predict the path of these vortex flows and avoid serious difficulty with them.

Shock wave interference from wings and wing-engine nacelles can interfere with static stability when these waves flow across control surfaces, Ames engineers demonstrated. The 6-by-6 supersonic wind tunnel was used to show the shock wave flow over a model and its effect on yaw at Mach 1.6.

An intensive flight test program with a Boeing B-47 has indicated that bending of flexible wings can change the flight characteristics of an aircraft to such an extent that design formulas applied to rigid aircraft no longer are valid, NACA reported. Bending not only changes angle of attack but also alters lift distribution.

During the test program, the B-47 wing tip bent some 20 ft. from a push-down to a pull-up maneuver. Such extensive bending of sweptback wings produces a twisting which can alter flight characteristics. These effects can be alleviated by placing weight near the wing tips in the form of engines or fuel tanks, a procedure used on many aircraft already flying.

Aeroelasticity is also an important factor to be considered in the design of autopilots, NACA warned. Said a researcher:

"The autopilot measures the airplane motion, compares this with the desired motion, and then sends corrective signals to the controls. Systems such as these become potentially dangerous on a flexibile airplane because a measuring device on the airplane cannot distinguish vibrations of the airplane structure from motions of the airplane as a whole."

Resulting autopilot signals could produce oscillations in response to gust vibration that could result in structural failure, he said.

From studies with the Boeing B-47, NACA is providing data to aid in the design of transports and bombers which can carry greater loads without sacrificing margins of stability and control.

Analog Computers

Use of analog computers to simulate aircraft responses compares favorably with actual flight test results in many instances, NACA said. But flight tests must be conducted to assure that the correct equations are being fed into the computer, it was emphasized.

Researchers reported that analog computers have been used successfully to check out proposed control systems prior to flight as well as for studying the dynamic properties of the airframe itself. NACA scientists termed their increasing use of these computers a new technique which is significantly increasing the "fruitfulness and the safety of much of our work."

Junk ASPR Revision, Industry Urges

By Claude Witze

Washington, D. C.—Junking of the changes which the Defense Department proposes to make in the cost-allowability section of the Armed Services Procurement Regulation is recommended by the aircraft industry.

An Aviation Week survey of comments on revisions recommended in Section XV of ASPR indicates that the aircraft industry has considerable outside support for its stand.

The National Security Industrial Assn. says the proposed draft "is so drastic and contains so many objectionable features that it should not be released until there has been a full and complete across-the-table discussion between representatives of the Department of Defense and of American business as to the basic principles involved."

Lengthy Fight Looms

The Radio-Electronics-Television Manufacturers Assn. said it sympathizes with the aims of Pentagon lawyers but fears at some points the new rules will cause "misunderstanding and confusion" and that others will "tend to crystallize lower echelon thinking."

This evident conflict between spokesmen for some of America's largest and most important business firms and the lawyers of an accepted business-dominated administration loomed in Washington last week as the opening round in a long fight over what the government will pay for under a cost-plus-fixed-fee contract. Indications were that industry was preparing for a battle over conference tables.

In an unusually firm stand, Aircraft Industries Assn. said in its memorandum to the Defense Department that it favors continuance of the present cost principles in the existing ASPR Section XV. It said they are simple and "not administratively unwieldy." The proposed revision, on the other hand, is viewed by AIA as "not merely a new set of cost principles, but (it) would become a set of detailed instructions to auditors and contracting officers regarding the procedures to be followed in the determination of allowable costs under cost-reimbursement type contracts."

NSIA charged that the proposal falls far short of following "generally accepted accounting principles and practices" and in this respect is worse than the existing Section XV. It detected "an unjustifiable disinclination on the part of the government to share in the normal costs of doing business, from which the government derives clear and demonstrable benefits."

Industry Arguments

NSIA found the following evidence to prove its charge:

- **The draft requires** the imposition of hindsight judgment of military audit personnel in reviewing the reasonableness of management decisions.
- **The draft interjects** a requirement that the auditor evaluate the equities of the situation, in addition to his usual function of measuring the reasonableness of the amount and the proper allocability of the item.
- **The draft arbitrarily discriminates** against contractors with more than 25% government business.
- **The draft enters** into a detailed treatment which apparently is an attempt to cover peculiar circumstances of "special cases" in an attempt to "define, delineate and clarify cost determinations of individual items." This results in arbitrary, unilateral and artificial determinations of allowable costs which is not consistent with sound business practice and is very unfair to government contractors.
- **The draft in many cases conditions** the determination of allowable costs upon authorization by special contract provision or by written authorization of the contracting officer, which is wholly unsatisfactory and unrealistic.

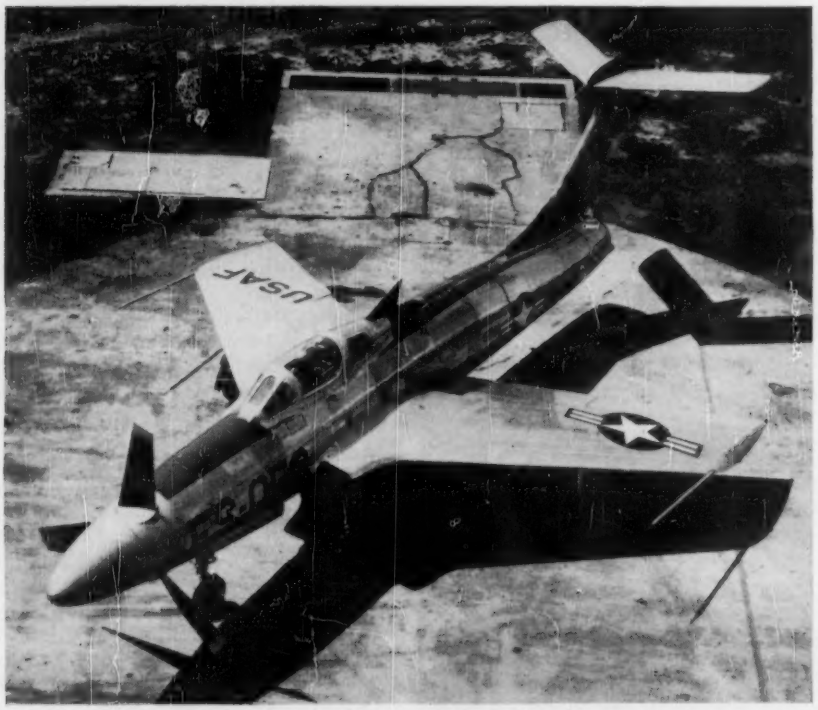
Ten Groups Participate

Major points of contention between the Defense Department and industry turned out as expected—the cost-allowability of profit-sharing and stock bonus plans (AW Apr. 25, p. 12). The provision for more liberal allowance of research and development costs ran into serious snags, mainly because the Defense Department wants to know the results of general research projects for which it pays all or part of the cost.

In general, opinions of the AIA and the NSIA were similar. RETMA submitted a much shorter list of comments and suggested revisions with emphasis on matters of import to avionics manufacturers. In all, ten industrial associations submitted their reactions to the Pentagon by the June 20 final deadline.

On the subject of bonuses, the proposed new Section XV places limitations on the circumstances under which the cost will be allowed. These range from "reasonableness" to a ceiling of 15% of an employe's total basic pay.

Industry reaction to this was that it



Turboprop XF-84H Nears Flight Testing

Republic's XF-84H, a flying testbed for supersonic propellers, nears flight test stage at Edwards AFB, Calif. Allison T40 turboprop engine is rigged with an afterburner for extra power, and drives an Aeroproducts prop. Later tests, using Hamilton Standard and Curtiss propellers, will provide data on feasibility of turboprop fighters. First photo of the XF-84H appeared in Aviation Week, Apr. 25, 1955, p. 15.

would give government auditors the duty of passing judgment on how a corporation chooses to pay personnel, imposes unreasonable limits on the method of payment and ignores the benefits that come from features of some profit-sharing and pension programs.

A requirement that the volume of government contracts be considered as a factor in allowability of bonus costs brought the comment from RETMA that "some companies with little or no government business pay their executives far more than do other companies with a preponderant government business. . . . Small companies in the non-defense category often pay more than large companies in the defense one, and vice-versa."

AIA objected to the limitations, arguing that they discriminate against defense contractors, particularly the aircraft industry. It warned that proposed rules would encourage pirating of top management and technicians and indicates the government "wants neither incentives, suggestions nor safety."

On the subject of pension and retirement plan costs, the new section is criticized for holding that approval for tax purposes by the Internal Revenue Service does not warrant allowability. NSIA holds that a plan dependent on profits and approved as a tax reduction should be acceptable.

U. S. Air Force already has instructed procurement personnel to exclude incentive compensation in contract negotiations. NSIA protested in April that USAF was taking unilateral action and not sharing the "normal cost of doing business."

Research Terms Protested

Terms which would liberalize the allowability of "blue sky" research and development work are under heavy fire. NSIA says the new rules are a constructive effort to encourage research but fences the funds in with so many limitations that it destroys the intent.

A demand that the contractor divulge results of the research is feared because it means that the secrets could be divulged to competitors. NSIA also holds government has no need for information —it only has to benefit from results.

A restriction which makes research and development costs allowable only when the contractor does 75% or more of his business with non-governmental customers, brought strong protests of discrimination. AIA quickly pointed out that it would penalize firms which devote nearly all their production to national defense.

Industry representatives have been assured they will have an opportunity to meet Defense Department officials for a discussion of the new ASPR code. It is expected that the meeting will be held in August or September.

Mating Air Inlets with Turbojets Troubles Supersonic Plane Design

Los Angeles—Matching the air inlet system of the airframe to turbojet engine requirements is becoming an acute problem as speeds move into the supersonic region.

The approach of this difficulty has been foreseen for some time (AW July 12, 1954, p. 28). "But it is only recently that the seriousness of the problem has begun to be fully appreciated," says Eugene J. Manganiello, assistant director of the Lewis Flight Propulsion Laboratory of the National Advisory Committee for Aeronautics.

An indication of troubles encountered in this engineering area is the urgent "fix" program on the Douglas F4D Skyray now underway at the Air Force Flight Test Center at Edwards AFB (AW June 20, p. 9). Other supersonic aircraft also have encountered difficulties in recent months due to improperly matched air inlets and engines.

U. S. and British spokesmen focused attention on this new area of trouble at the recent Fifth International Aeronautical Conference held here by the Institute of the Aeronautical Sciences and the Royal Aeronautical Society.

Looking for Answers

It was evident at the conference that there is some controversy between engine and airframe designers on where the greatest responsibility for solving the problem should rest. One aircraft designer complained of the "sensitivity" of the engine in his airframe. But a spokesman for an engine manufacturer pointed out that a less sensitive engine would mean a heavier engine and would therefore work to the ultimate disadvantage of the supersonic aircraft designer.

The correct answer, he implied, is not an engine which will tolerate bad flow distortion; what is required instead is for the airframe designer to match his inlet duct design to the moderate distortion tolerance of the engine. The argument centers around the definition of the word "moderate."

A spokesman for Republic Aviation Corp. noted "this problem has been recognized by the airframe people for some time." He suggested that it is necessary to work from both sides toward a satisfactory compromise inlet-engine matching.

Edward H. Heinemann, Douglas Aircraft's El Segundo Division chief engineer and designer of the F4D, put it this way in his paper on the design of highspeed aircraft:

"Several powerplant problems, other than the obvious need for high inlet pressure recovery, assume increasing importance at higher speeds with turbojet planes.

"One of the most important of these is the problem of flow instability at supersonic speeds. . . . At Mach numbers above 1.5, it is extremely difficult to take engine air aboard at good efficiency without obtaining flow instability. . . . To avoid this instability, it is necessary to operate the inlet over a very narrow range of mass flow conditions.

"Solutions to this problem generally lie in the direction of variable geometry inlets or other devices which result in the inlets operating at maximum mass flow regardless of engine air requirements."

(A variable geometry inlet is not among the "fixes" for the F4D being tested at Edwards AFB, however. Solutions being flight tested there, AVIATION WEEK has learned, include: drooping of the lower lip of the airframe inlet duct; extension of the inlet duct; installation of rods in the duct to change the airflow.)

Another associated problem, Heinemann points out, is inlet flow pattern distortion, resulting from disturbances

Decade Old

Matching turbine engines and airframes, which is discussed in this second report from the Fifth International Aeronautical Conference by Aviation Week's West Coast Editor William Coughlin and Senior Engineering Editor Irving Stone, is not a new problem. It has been known in the aircraft industry for at least ten years.

In the spring of 1945, the General Electric Co. sponsored a technical symposium on the new engines. During a propulsion forum, Perry W. Pratt, Pratt & Whitney Aircraft, said:

". . . The increasing importance of matching the airplane and its powerplant to best accomplish a given assignment might be worthy of some discussion. . . . The engine manufacturer is now in a better position to make a greater contribution than has been possible in the past to the proper matching of the airplane and its powerplant. . . .

"I do not wish to infer that it will be either possible or practical to 'tailor-make' a powerplant for each individual airplane design, but I do feel that the gas turbine will make it possible for us to more closely approach that Utopia of the airplane designer."

How to Evaluate Compatibility

An adequate plan for evaluating compatibility of a particular induction system and engine combination, GE's J. S. Alford believes, should include the following factors:

- Test a model of the induction system in a wind tunnel under the wide range of pitch and yaw angles, mass flows and Mach numbers required by the particular operational aircraft.

Measure flow distribution patterns and compare with similar flow patterns from inlet ducts having good distribution, for indications whether the duct should be redesigned before proceeding.

- Determine whether the engine will tolerate the flow distortion without unreasonable penalty in performance, blade vibration, or ease and reliability of operation.

Install a full-scale induction system on the engine in a static test stand.

- Install suitable screens in a special inlet duct to test the engine with inlet distortions simulating those occurring in flight.
- To evaluate tolerance at high corrected engine speeds, tests should be made in a facility providing an adequate supply of cold air. Data resulting will give a complete picture on whether the particular inlet duct and engine are suitably matched.
- Flight tests on the actual airplane will give the final definitive answer on compatibility of inlet duct and engine.

in the forward part of the induction system. Poor flow distribution, he says, can result in serious reduction in engine compressor stall margin, particularly for an engine that is stall-sensitive.

Example: In the case of the F4D-1, early flight tests with the original inlet and engine configurations gave compressor stalls during climb conditions at altitudes as much as 10,000 ft. below the plane's combat ceiling.

In the case of some engines, he says, poor inlet flow can result in vibratory stresses on the rotating parts, and possibly engine hot spots. Solution obviously lies in the development of improved air intake systems and less sensitive engines, Heinemann says.

Several other problems which can arise with highspeed airplane powerplant installations include duct rumble from flow separation ahead of side inlets at low air flows, separation from inlet lips at high angles of attack or low mass flows, and symmetric duct flow which can result when two ducts are joined under conditions of low mass flow.

Performance Factors

Eric S. Moult, de Havilland Engine Co.'s chief engineer, also touched on air inlet-engine performance factors in his paper "Power Plants for Supersonic Flight."

If internal losses and spillage are to be kept to a minimum in turbojets, the intake should be matched as nearly as possible to the breathing requirements of the engine, he says.

With subsonic aircraft, it is usually possible to strike a compromise, and select an intake having reasonable efficiency over the whole operating range.

"At supersonic speeds, however, such a compromise is difficult and, at off-design conditions, excessive spillage and poor pressure recovery can occur," Moult observes.

"An adjustable 'spike' or centerbody should enable a good pressure recovery to be maintained over a wide speed range: a variation in area of the intake minimizes the spillage and resultant external losses." This tallies essentially with Heinemann's view.

While an intake of variable geometry adds weight and complication, Moult claims, its adoption may be a vital factor in determining the overall efficiency.

Commenting on typical intakes designed and adjusted for selected flight speed, he points out that ram pressure at Mach 2 at sea level can amount to 100 psi., falling to 24 psi. at the tropopause, but rising again to 80 psi. if the speed is increased to Mach 3 at the same altitude.

Presenting a broad, definitive paper titled "Inlet Duct-Engine Flow Compatibility," General Electric Co.'s J. S. Alford declared that an adequate test program of matching the induction system to engine requirements should be initiated for each installation.

He urges airframe and engine builders to improve compatibility of the inlet duct and engine through adequate programming in these areas:

- **Design of induction system** for good flow distribution.
- **Development of flow** distribution devices.
- **Design of compressors** to tolerate moderate distortion.
- **Providing adequate margin** in the engine cycle.
- **Development** of more accurate engine control.
- **Matching duct flow** distribution to engine requirements.

Examining causes of inlet flow distortion, Alford says that in submerged jet engine installations, the inlet duct must be compatible with efficient design of the main structure, cockpit armament and landing gear. Ducts often have sharp curves and bends, a frequent source of flow separation.

Off-design mass flow ratio and high angles of pitch or yaw also cause flow separation. Increasing the range of inlet duct flow parameters and angles over which stable and efficient operation must be provided increases the difficulty of providing a uniform entry velocity to the compressor for all conditions.

Alford cited this example: During flight at supersonic speeds, if the throttle is quickly retarded so that engine air mass flow is substantially reduced, a flow instability known as "buzz" occurs in some induction systems. Resulting large amplitude of pressure pulsation may create a safety hazard as well as an unstable transient condition.

Flow Improvement Devices

Under certain conditions freely rotating blade can be applied successfully to improve severe velocity gradients in an annulus at the compressor face. The rotating blade transfers energy from regions of high axial velocity to those where the velocity is low, Alford says. Other devices:

- **Screens** placed across the inlet also are effective in reducing distortion, but the relatively large losses make screens a last resort method for solving the problem, he maintains.
- **A diffuser** when followed by a rapid acceleration reduces the distortion at the compressor face. Effectiveness appears to depend partly upon mixing.

In addition to the diffusion process introducing more losses, space available for a diffuser usually is limited.

- **A relatively straight cylindrical section of duct,** when placed ahead of the compressor face, results in mixing in the duct, which reduces distortion magnitude. Here again, space limitation is a factor.
- **Stationary mixing devices** have been used where axial length is limited. These mixing devices have been used at times to correct maldistribution of flow from the compressor discharge to the combustion chamber.

However, relatively little work appears to have been done, Alford says, to apply these devices to correct bad distortion from the induction system.

Alford believes an experimental program is required to evaluate the tolerance of various compressor designs to inlet flow distortion.

If turbojet engines were designed deliberately to tolerate large distortions of flow, it would substantially increase the specific weight of the engine. It would be a mistake to penalize airframe designs which have good flow distribution by imposing this extra engine weight and performance loss.

Defense Management Shakeup Is Urged

Washington, D. C.—Creation in the Air Force, Navy and Army of positions for an Assistant Secretary for Research and Development and Assistant Secretary for Logistics has been proposed to Congress by the Hoover Commission.

For the aircraft and avionics industries, this is the most important change recommended in the 148-page report on Business Organization of the Defense Department.

At the present time only the Air Force has an assistant secretary solely responsible for research and development. The Army has an Assistant Secretary for Logistics and Research and Development. The Hoover report calls for splitting this into two separate jobs. Navy does not have either logistics or research and development specifically handled by an assistant secretary.

Another major change would be the formation of a new Defense Supply and Service Administration at the same level as the three services. The report says this would be the most important step toward saving an estimated $2 billion annually. The proposed administration would be concerned with the purchase of common-use, commercial items and medical supplies.

Coordination Obstacles

The commission said that four obstacles are impeding close and productive working relationships among top defense executives. They are:

• **Decisions and information** do not flow freely from the Joint Chiefs of Staff to the Assistant Secretaries of Defense. A weakness exists in top defense management which deprives our nation of the intended benefits of full civilian participation in formulation and execution of defense plans and programs.

• **Assignment of responsibilities** among members of the Secretariat in the Office of the Secretary of Defense impedes effective coordination. This is due to the numerous inter-relationships among the functions for which these executives are responsible. There is a lack of similarity in assignments to the Assistant Secretaries in the Office of the Secretary of Defense and in the military departments.

• **Responsibilities of the assistant secretaries** in the military departments differ significantly in nature and scope—a condition which complicates coordination and understanding among the various offices.

• **Responsibility for the management** of support activities is not clearly defined between the prinicipal military and the principal civilian executives.

"The total management job in the Office of the Secretary of Defense," the commission said, "has been sub-divided in a manner which creates problems of coordination among some of the assistant secretaries (particularly in the areas of supply, facilities, research and applications engineering). Furthermore, the present organization results in awkward working relationships with the military departments, since it is more elaborate than the Secretariats within the three departments where actual operations are performed."

Outmoded Systems

The commission blamed outmoded systems for most of the difficulties encountered by the Defense Department. "These officials have struggled manfully with these tangles and have brought about many improvements. Considering the difficulties under which they labor, the Defense Department is better administered than might be expected. . . Many of the weaknesses discovered are due . . . to the expansion of the military services in 20 years from a civilian personnel of about 140,000 to 1,180,000 and a military personnel of 250,000 to nearly 3,000,000," the Commission said.

"Because national survival is at stake cost cannot be the primary factor," the commission said. "In the words of a prominent flag officer, 'our military people are not hired primarily to see how little they can get along with; they are hired primarily to seek to get enough material to meet their responsibilities.'"

The commission also recommended a reduction in the number of assistant defense secretaries. Four "management assistant secretaries would be created:

• **Assistant Secretary for Logistics.** Responsibility covering materiel and services, including functions now assigned to the assistant secretaries for supply & logistics, properties & installations, and health & medical.

• **Assistant Secretary for Research and Development.** Responsibilities of the present Assistant Secretary for R & D and the present Assistant Secretary (Applications Engineering).

• **Assistant Secretary for Personnel.** Responsibilities now assigned to the Assistant Secretary (Manpower and Personnel), but with increased attention to career development.

• **Assistant Seretary for Financial Management.** Responsibilities now assigned to the Assistant Secretary (Comptroller), but with increased attention to accounting policies and other financial practices.

The committee making the study was headed by Charles R. Hook, of Armco Steel Corp.

Hoover Unit Proposes 19 Changes

The Hoover Commission report on business organization of the Department of Defense offers the following recommendations to the Secretary of Defense:

• **Create** a civilian position invested with sufficient stature and authority to insure the establishment and maintenance of effective planning and review of military requirements. The official occupying this position would, on behalf of the Secretary: maintain active liaison with National Security Council, Joint Chiefs of Staff and their staffs; coordinate all guidance provided at the Office of the Secretary of Defense level to the military departments covering the preparation of requirements programs; provide for a system of effective review and analysis of defense plans and requirements computations.

• **Emphasize** the management of logistics, research and development, personnel and finance, and regroup certain functions under assistant secretaries to strengthen coordination.

• **Appoint** a career assistant to each Assistant Secretary of Defense of such stature and competence that continuity of administration will be improved.

• **Revise** the assignments of departmental assistant secretaries to secure a uniform grouping of management responsibilities similar to that proposed for the four management Assistant Secretaries of Defense.

• **Define** the relationship of the military chief of staff to the support activities as that of: planning and requesting the materiel, services, facilities and specialized personnel required to support the operating forces subject to the review and approval of the Secretariat; exercising direct authority over tactical and combat-related support activities performed by the logistics organization.

• **Assign** to the Assistant Secretary for Logistics in each department direct management control over supply and service activities.

• **Assign** clear responsibility for the coordination of research and development

The Hoover Commission report on budgeting and financial management by the Department of Defense is reviewed in an article on page 21.

programs to an Assistant Secretary for R&D in each department.

• **Establish** a personnel system for support activities which provides comparable standards for selection, training, promotion and compensation of both civilian and military managers and technical personnel.

• **Require** members of the Secretariats to participate in developing and apply the career management program in activities under their jurisdiction.

Following are their recommendations requiring congressional action:

• **Enact** legislation establishing a separate civilian-managed agency, reporting to the Secretary of Defense, for common supply and service activities.

• **Legislation** establishing the separate supply and service agency should specify criteria which will assure a strict supporting role for the agency.

• **Separate** agency should be named the "Defense Supply and Service Administration," and its administrator should be a presidential appointee.

• **Instruct** the Secretary of Defense to report semi-annually on progress being made in improving all phases of the supply and logistics system.

• **Enact** legislation to minimize present obstacles to government service by outstanding citizens, and should provide positive incentives which will attract and hold able administrators. Examples of improvements which should be made are: increase the level of compensation for assistant secretaries; modify the "conflict of interests" laws so that presidential appointees are not forced to liquidate lifetime business equities in order to accept federal appointment.

• **Enact** a Title V to the National Security Act to provide the legislative basis for specializing management and technical personnel in the support activities. This legislation should establish these basic principles: military personnel will be limited primarily to posts in tactical organizations, and civilian personnel will be utilized increasingly in management and technical positions in support activities; criteria will be established for use in determining those management and technical positions in support organizations which will be filled by civilian personnel and those which must be filled by military officers.

• **Incorporate** criteria in title V to the National Security Act which will clearly distinguish the proper roles for civilian and military support managers and technical personnel and should direct immediate application of these criteria by the Secretary of Defense.

• **To improve** the financial tools of management Congress should enact legislation to enable the Department of Defense to prepare and administer budgets on an accrued expenditure basis; Department of Defense should continue and extend the use of systems of accrual and cost accounting and, wherever it will add to efficient management, the use of working capital funds; Department of Defense should intensify its efforts to establish complete inventory records, and continuing and effective inventory controls.

• **To fix** responsibility for managing defense dollars each Assistant Secretary of Defense should be responsible for screening the requirements programs of each department for his area of functional jurisdiction and for advising the Assistant Secretary of Defense for Financial Management as to the financial needs for such activities; each departmental assistant secretary should be held responsible for screening requirements and for participating in the formulation and continuing review of the budget for those activities and programs under his jurisdiction.

• **Congress should amend** existing legislation to assign each Assistant Secretary for Financial Management exclusive supervision of the departmental comptroller organization; pending legislative action, Secretary of Defense should accomplish this by directive.

Jet Engine Policy Stresses Quality, Not Standardization

New Defense Department policy governing development of jet engines has been rewritten to emphasize quality instead of standardization.

Distributed to the industry last week, Directive 3230.2 eliminates proposed rigid thrust ratings and engine diameters set forth in an earlier draft and represents a victory by the manufacturers who protested the original proposal (AW Jan. 24, p. 18).

In addition, the new directive makes it clear that the Defense Department intends no longer to keep engine factories busy only because the government has a substantial investment in their plants. Manufacturers who cannot demonstrate performance, capability and a contribution to the art will be handicapped under the regulation.

Responsibilities Outlined

Major points in the directive are:

• **Army, Navy and Air Force** are made individually responsible for determining their requirements, planning and implementing their programs.

• **At Defense Department level,** responsibility will be limited to surveillance to insure that policy is followed, programs are sound and integrated and funds effectively utilized.

• **Military procedures** must be flexible to provide for changing technology and they must take precautions against expensive modifications and limited combat capability.

• **In each category,** basic engine thrust classes should be established with each class approximately 50% larger than the next smaller class.

• **The three services** must have frequent evaluations of individual projects.

• **Competition** must be fostered within the industry.

• **Effective** use must be made of the investment in the industry, but it must not outweigh factors of past performance, capability and contribution to the state of the art.

• **Mobilization** base must be maintained.

• **Army, Navy and Air Force** must follow uniform policy in financing new engine development projects. Research and development funds should be limited to new design concepts and procurement funds used for making them operationally useful.

Competition Emphasized

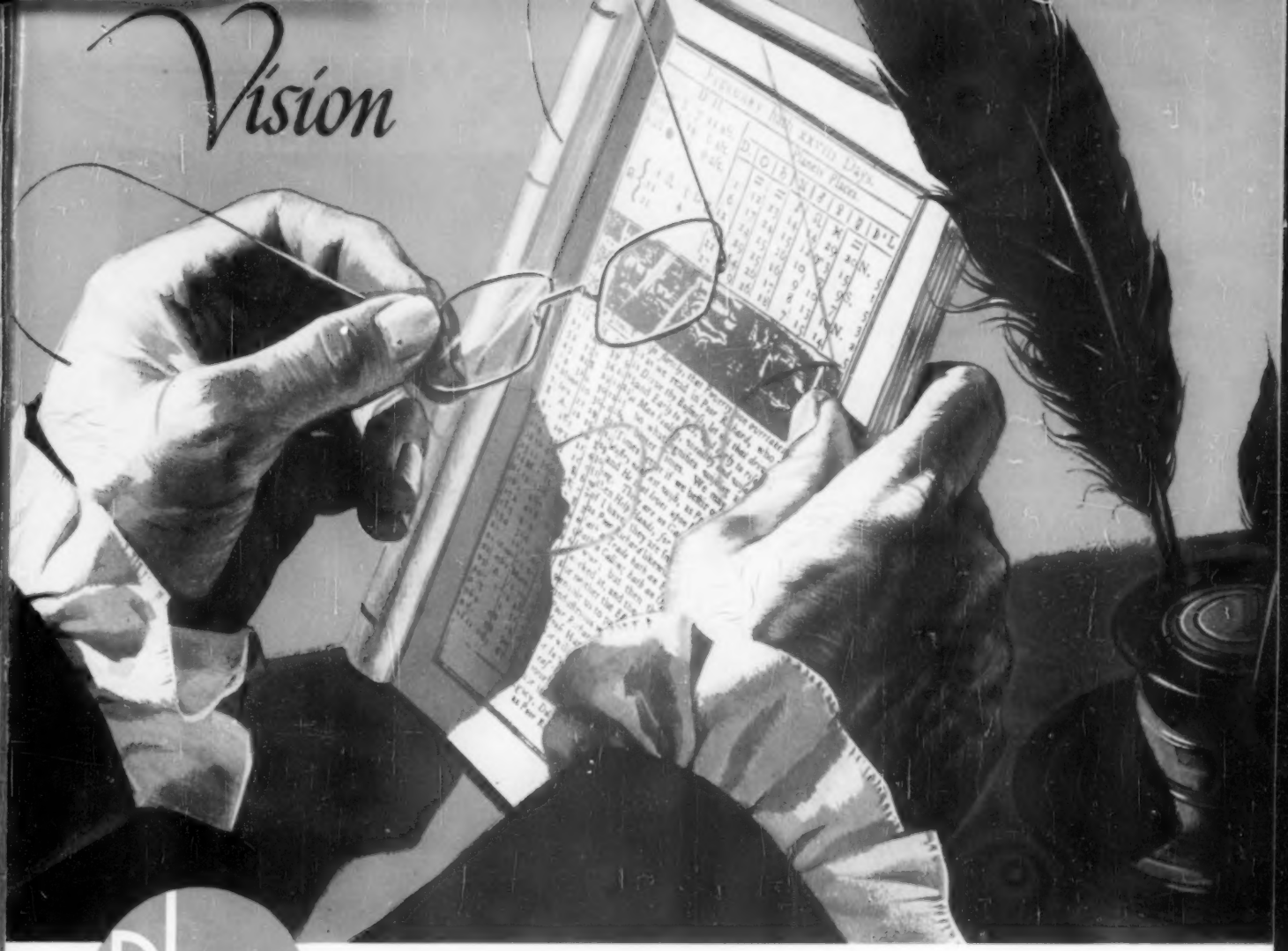
In an outline of procedures, further emphasis is put on the competitive aspects of engine development, a factor that the industry felt was in jeopardy under terms of the original Defense Department proposal put forward early this year.

"When appropriate," the procedure says, "the services should conduct formal competitions, asking all capable companies to bid on a new engine development to meet stated requirements. Such bids should be evaluated in accordance with formal rules established by the services.

"In some instances, it may be appropriate to encourage the companies to study the military propulsion problem on a broader scale. This process is more likely to disclose novel approaches which may have more long term potential. . . .

"If a company proposes a novel and significant engine development project, and if investigation reveals that no other company can provide as good a solution during the same time period, a sole source contract may be awarded without formal competition."

Provisions of the new directive will be monitored by the Joint Coordinating Committee for Piloted Aircraft, composed of members from the office of Donald A. Quarles, Assistant Secretary of Defense for Research and Development; Frank D. Newbury, Assistant Secretary for Applications Engineering and senior officers from the three military departments.



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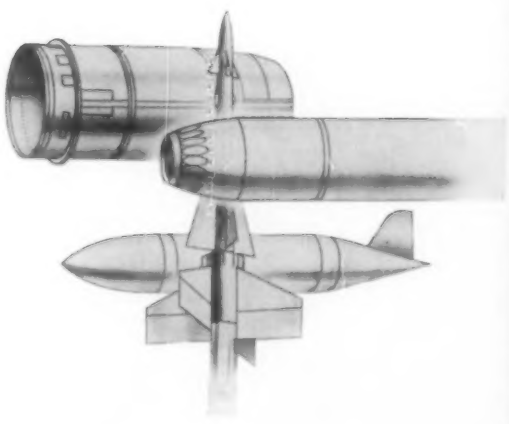

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TERRAIN

THE VARIOUS TYPES of terrain surfaces have a significant effect on the air masses flowing over them—with a consequent effect on the weather and plane performance.

One of the most spectacular effects of terrain on air currents is the Mountain Wave—a high-reaching deflection of the winds when a range of hills blocks a strong flow of air. This sets up a "wave" which may reach high altitudes and extend in a chain of waves for several hundred miles downstream. The Lenticular-Type Standing Wave Cloud identifies these large waves. Even small ridges may cause air waves and produce dangerous downdrafts on the lee side (see diagram at right).

Care should be taken in approaching a ridge into the wind, because in a low-powered plane the downdraft may make it impossible to maintain enough altitude to clear the top. Also, when taking off on a runway towards a hill, be prepared for a decreased rate of climb if the wind is coming over the hill.

When flying in the vicinity of mountain tops, the possibility of altimeter error is important. Two primary factors can cause altimeters to indicate *higher altitudes than actual*: Lowered pressures created by disturbed flow on the lee side and abnormally cold temperatures. Combined, they can produce errors in excess of 1000 feet.

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Flying over rough terrain, shifty air currents and sudden downdrafts can call for extra-quick engine response. Here's where insisting on the right fuels and lubricants can pay off.

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Hoover Group Urges Effective Military Fund Curbs, Reforms

Washington, D. C.—Budget reforms to do away with the carrying forward from year to year of huge unexpended appropriations, particularly in the Department of Defense, has been recommended to Congress by the Hoover Commission.

Pointing out that the federal government's unspent funds ran as high as $78 billion in Fiscal 1954, $68 billion in Fiscal 1955 and will hit an estimated $54 billion in Fiscal 1956, the commission called for more effective control by either Congress or the executive branch.

The report said the commission's task force found the procedure has been "to review in minute detail the new program for the budget year under consideration, with little consideration of past performance. This inadequacy applies particularly to military procurement."

'Cumbersome Structures'

In addition, the report says, effective fiscal management in the Defense Department "has been hampered by overdetailed and cumbersome allotment structures." It continued:

"The effect of attempting to control operations through such a system places emphasis upon the ability of organizational units to expend no more than predetermined ceilings. The ability to live within such ceilings is no real gauge of performance. Such a system actually puts a premium on the ability to expend all allotments since the allotments for one year are used as one indication of the amounts required for the succeeding year."

Other findings included:

- **Funds should be controlled** under a system whereby there would be only one allotment to an organizational unit from each applicable appropriation.
- **Accounting systems** should be developed from which performance can be appraised in terms of cost.
- **Costs of military support activities** must include, as they do not now, the cost of military personnel employed in them.

The report says operating a budget in terms of future obligations rather than expenditures has its greatest impact in the Defense Dept., where 45% of the budget is for multiple-year programs.

Lacks Screening

Additional criticism of the Defense Department was made over the lack of effective controllership both at the Department of Defense level and in the Army, Navy and Air Force. The Hoover Task Force said creation of a defense comptroller in 1949 was a sound step, but this assistant secretary is too much burdened with matters of operating policy.

The report said:

"The lack of a civilian screen in the Office of the Secretary of Defense on Military Logistic Requirements, has resulted in reliance on financial controls exercised by the comptroller as a substitute for such a screen.

"If the Assistant Secretaries of Defense who are responsible for the several functional areas of the department's activities made a more searching review of the requirements under their respective jurisdictions, the comptroller could be relieved of heavy responsibilities in a field which is not logically his."

The report said responsibility in the three branches of the armed forces should be clear-cut and centralized in each service's Assistant Secretary for Financial Management.

"There is no justification," the report declares, "For making this a function for which the chief of staff should have responsibility."

In the Army, the comptroller, Lt. Gen. George H. Decker, is under the office of the chief of staff. In the Air Force, the comptroller is Lt. Gen. C. B. Stone III, a deputy chief of staff. Navy's comptroller is a civilian, William B. Franke, in the executive office of the secretary.

Comptroller Requirements

The Hoover task force also calls for more career specialists in the military budget offices and says that the comptrollers should be civilians in all cases. For the Defense Department, it makes two recommendations:

- That in selecting individuals for

Renegotiation Approved

A provision authorizing the balancing of losses against profits over a five year period in renegotiation determinations was approved by the Senate in passing legislation extending the Renegotiation Act to Dec. 31, 1956. The measure has already passed the House.

This provision, and another provision authorizing a study by the Joint Congressional Committee on Internal Revenue to decide whether renegotiation should be continued beyond 1956, are at issue before the joint conference committee ironing out difference between the House and Senate versions of the extension measure.

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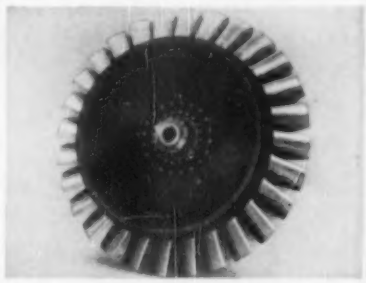

Engine vibrations are not transmitted to the fan blades because the blades are mounted on rubber. (U.S. Patent 2,595,829)

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MATERIAL: Aluminum — Magnesium — Stainless Steel—Castings—Forgings—Sheet Metal.

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PERFORMANCE: Total pressures up to 40 inches of water. Airflow up to 40,000 c.f.m.

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TESTING: All fans tested to meet applicable N.A.F.M. and MIL Specifications. Structural tests to 30 per cent overspeed (or as required). Our facilities are available for determining the performance characteristics of fans up to 48 inches in diameter. Equipment capable of measuring up to 140 input horsepower, through a Baldwin-Lima-Hamilton Shaft Torque Meter, 40 inches of water, and better than 40,000 c.f.m. is part of our installation.

Depending upon the size and shape, complete sections of airplanes and helicopters, including the engine, and necessary ducts or cowling can be installed in the wind tunnel for the purpose of studying cooling air flow patterns and pressure distributions through the engine and its component parts. The test shaft has a controllable operating range up to 3200 r.p.m.

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Double-heading is only one example of the almost limitless possibilities Hassall cold-heading offers you. If you have a fastener problem just send us samples or specifications for a quotation.

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More Viscount Sales

Total sales of Vickers-Armstrongs' turboprop Viscount have increased to 227 with new orders from British Overseas Airways Corp., Hughes Tool Co., Standard Oil Co. (New Jersey) and Norway's Fred Olsen Airtransport Ltd. Value of Viscount sales so far: more than $171 million.

Hughes purchased a Viscount "for study and analysis of the operation of propeller-turbine aircraft," and Standard Oil ordered an executive version of the plane.

BOAC purchased 12 Viscount 700Ds for delivery in mid-1957. Sir Miles Thomas, chairman of the airline, said the transports will be used on Caribbean and Middle East routes.

The Norwegian airline placed a contract for one Viscount in addition to two ordered in January 1954.

comptrollership, civilians with broad management and accounting experience and competence be appointed.

• **That the comptrollers** in military departments be responsible only to the secretaries of their respective services, and that concurrent responsibility to a chief of staff or equivalent be discontinued.

J. Harold Stewart of Boston was chairman of the commission's task force which undertook the budget and accounting study.

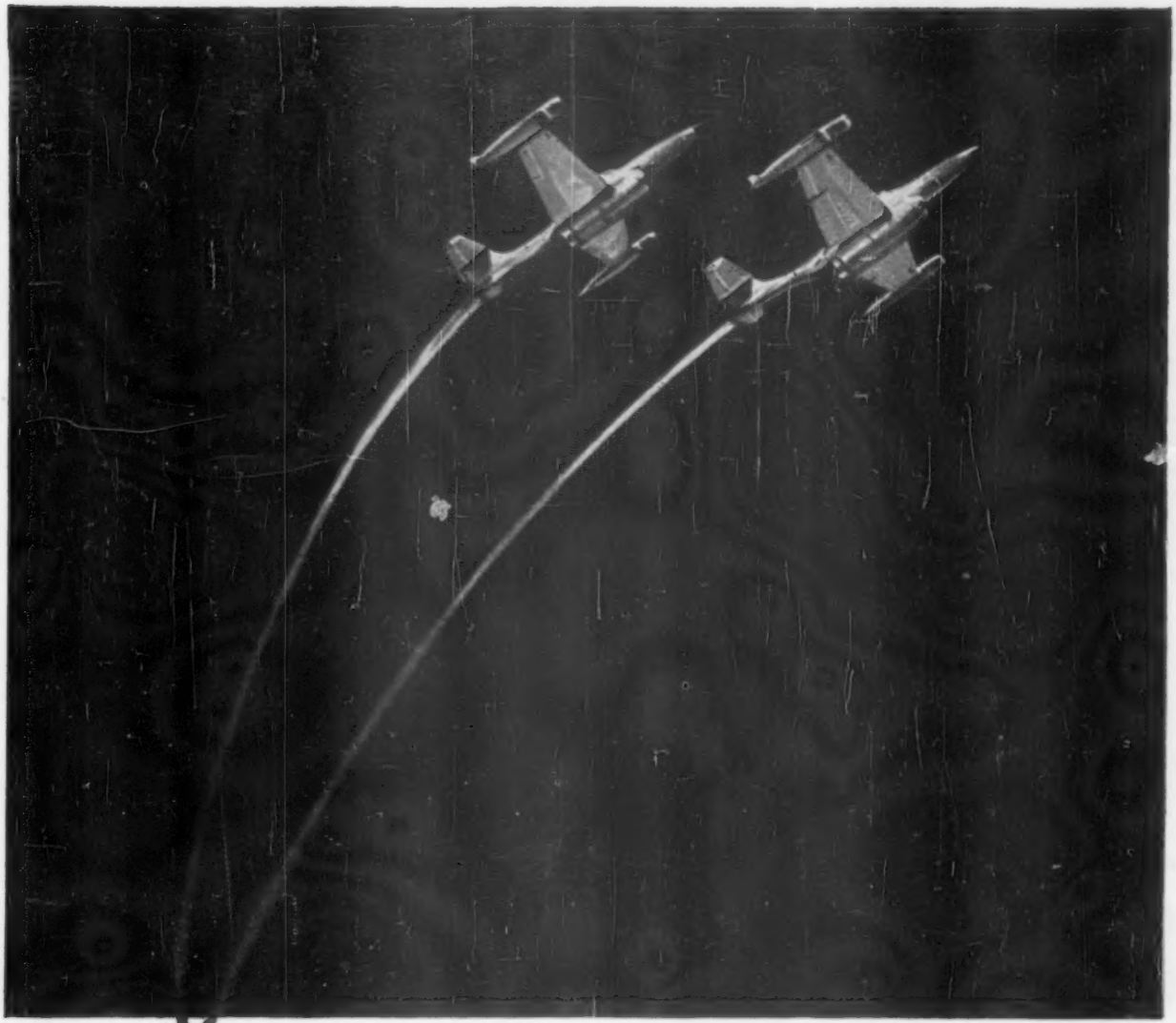
Board Proposes Lower TWA, PAA Mail Rate

A new, lower service mail rate for trans-Atlantic operations of Trans World Airlines and Pan American World Airways has been proposed by the Civil Aeronautics Board.

The new final rates, set through a ratio relating them to recently established service rates for the Big Four domestic trunks, are 54.76 cents per ton-mile for the period Apr. 8 to Dec. 31, 1954 and 53.5 cents for the period starting Jan. 1, 1955.

CAB estimates that the new rate would reduce service mail payments to the carriers $6,060,000 this year, compared with pay due under the old 85 cent rate.

The lower 1955 rate is based on substantial increases in mail traffic compared with 1954, due largely to increased shipment of military mail. The Post Office Department estimates that Pan American will fly 10,483,000 mail ton-miles this year, compared with 7,804,000 ton-miles in 1954. The estimate for TWA is 8,754,000 ton-miles this year compared with 6,918,000 last year.



The taming of the Blue

Mastery of the sky is not achieved through bolts and rivets — nor is cold metal the true measure of the task.

The fiber of the conquest is found in men.

This we know — for in fashioning wings and setting rivets we have come to know something of the men who plan and the men who pilot our nation's aircraft.

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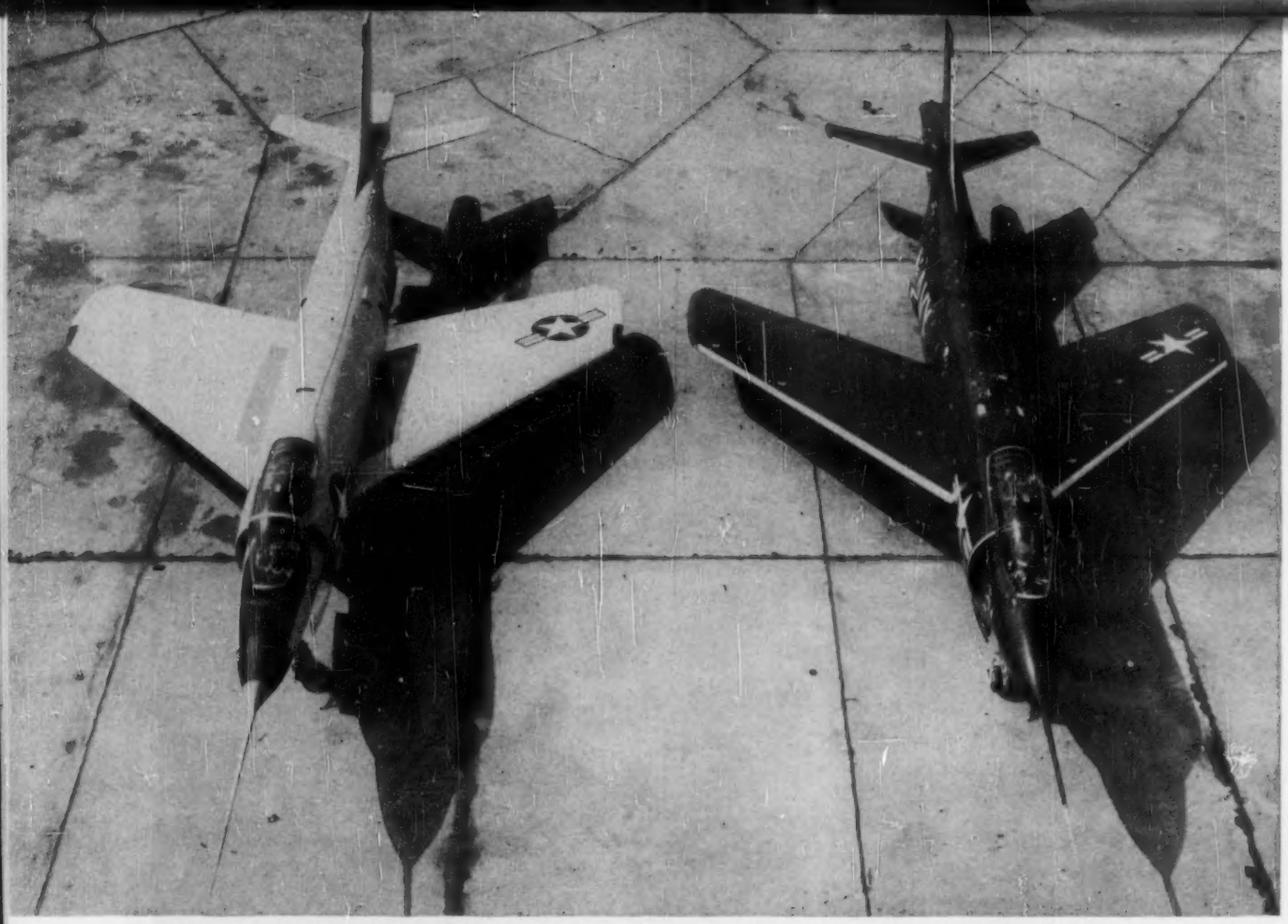
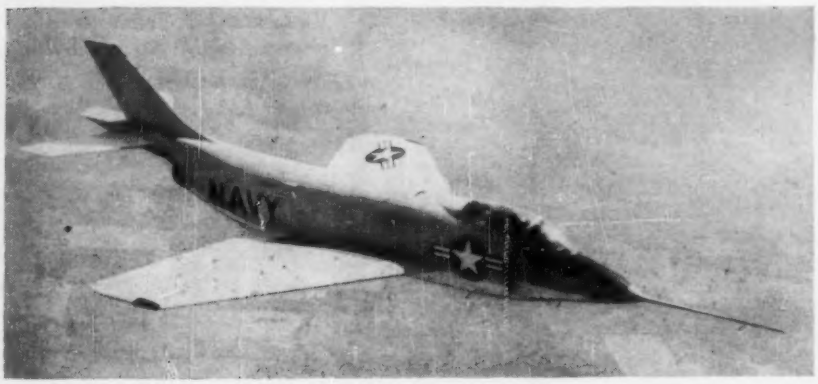


NEW DEMON: McDONNELL'S F3H-2N HAS LARGER WING, ALLISON J71 WITH AFTERBURNER FOR BETTER PERFORMANCE.

Larger Wing Improves Demon Performance

ALLISON J71 powerplant has its rated thrust of 10,000 lb. boosted by afterburner to about 15,000 lb. Original power in Demon was Westinghouse J40 rated at 7,500 lb. thrust. Engine economy, large fuel capacity insure long range mission.

WING AREA of Demon was increased by lengthening root chord, but span and tip chord are the same. Change in area is about 15 percent to new value near 500 sq. ft. Wing sweep angle is about 44 deg. Cannon, rockets and external stores arm the Demon; radar and fire-control equipment give it all-weather potential. F3H-2N is first Navy airplane to get gray and white color scheme.



ODM Grants Raytheon Fast Amortization

Raytheon Manufacturing Co., Wayland, Mass., has been awarded a $3,040,000 certificate of necessity by Office of Defense Mobilization, with 45% allowed for rapid tax amortization, for a facility for research and development of specialized electronic equipment.

Other recent certificates include:

Humble Oil & Refining Co., Baytown, Tex., aviation alkylate production facilities, $1,252,500 certified with 100% allowed; $178,500 certified with 45% allowed.

Lockheed Aircraft Corp., Burbank, Calif., military aircraft, $241,727 certified with 65% allowed.

Westinghouse Electric Corp., Anne Arundel County, Md., research and development in electronics, $976,473 certified with 40% allowed.

Douglas Aircraft Co., Inc., El Segundo, Calif., military aircraft, $115,846 certified with 65% allowed; Santa Monica, Calif., military aircraft, $523,394 certified with 65% allowed.

Solar Aircraft Co., Des Moines, Ia., aircraft engine components $49,189 certified with 60% allowed.

Fairchild Engine and Airplane Corp., Farmingdale, N. Y., military aircraft engines, $19,564 certified with 65% allowed.

Fairchild Aircraft Div., Hagerstown, Md., military aircraft, $52,835 certified with 65% allowed.

Bendix Aviation Corp., Hamilton Division, Hamilton, Ohio, military aircraft parts, $42,254 certified with 55% allowed; West Coast Division, Burbank, Calif., military aircraft engine parts, $47,725 certified with 65% allowed.

Neuschotz Engineering Co., Los Angeles, Calif., military aircraft parts, $34,792 certified with 70% allowed.

Foote Bros. Gear and Machine Corp., Chicago, Ill., helicopter parts, $9,714 certified with 65% allowed.

Stewart-Warner Corp., South Wind Division, Indianapolis, Ind., military aircraft parts, $53,899 certified with 65% allowed.

Robertshaw-Fulton Controls Co., Anaheim, Calif., research and development, $35,973 certified with 65% allowed.

Ryan Aeronautical Co., San Diego, Calif., military aircraft assemblies, $52,200 certified with 60% allowed; military aircraft assemblies, $25,000 certified with 60% allowed.

The Cleveland Pneumatic Tool Co., Cleveland, Ohio, military aircraft landing gear, $75,000 certified with 40% allowed.

Dayton Aircraft Products, Inc., Ft. Lauderdale, Fla., military aircraft parts, $80,262 certified with 50% allowed.

Aircraft Engineering Products, Inc., Clifton, N. J., military aircraft parts, $43,681 certified with 80% allowed.

The Albano Co., Inc., New York, N. Y., military helicopter parts, $16,286 certified with 70% allowed.

Thieblot Aircraft Co., Inc., Martinsburg, W. Va., research and development on military aircraft, $450,000 certified with 60% allowed.

B. K. Sweeney Mfg. Co., Denver, Colo., special tools for military aircraft use, $36,424 certified with 70% allowed.

Boeing Airplane Co., Wichita Division, Wichita, Kans., military aircraft, $22,643 certified with 60% allowed.

Sundstrand Machine Tool Co., Denver, Colo., facility for military aircraft alternator drives, $5,204,179 certified with 60% allowed.

Fairchild Engine and Airplane Corp., Fairchild Guided Missiles Division, Wyandanch, Long Island, N. Y., military aircraft, $223,984 certified with 65% allowed.

Hughes Tool Co., Culver City, Calif., military aircraft parts, $81,149 certified with 65% allowed.

Salt Lake Refining Co., Davis County, Utah, aviation gasoline, $282,000 certified with 100% allowed.

The Frank G. Schenuit Rubber Co., Baltimore, Md., military aircraft tires, $134,470 certified with 60% allowed.

Diecraft, Inc., Hereford, Md., military aircraft components, $525,500 certified with 45% allowed.

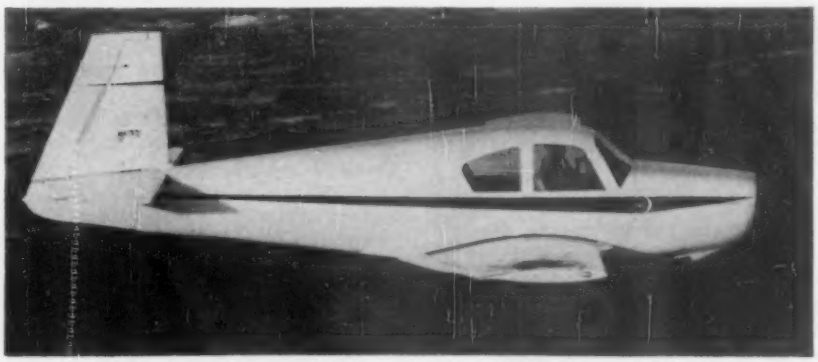
Republic Aviation Corp., Hicksville, L. I., N. Y., research and development in electronics, $162,610 certified with 65% allowed.

Lockheed Aircraft Corp., Burbank, Calif., military aircraft, $340,625 certified with 60% allowed.

C-82 Bids

USAF's Air Materiel Command has received successful bids for 93 C-82 transports offered for sale at San Antonio Air Materiel Area (AW May 16, p. 20). Total price was reported to be $837,512.

Sales must be approved by the Department of Justice, since they involve equipment that cost the government more than $1 million.



New Mooney Four-Placer

New Mooney M-20 four-place business plane, priced at $12,500, has been ordered by 20 company distributors. The Kerrville, Tex., builder plans to produce about 200 M-20s in the next 12 months. Powered by a 150-hp. Lycoming, the airplane grosses 2,450 lb., weighs 1,335 lb. empty. Maximum cruise speed at 75% power is 170 mph. Most economical cruise speed, 60% power, is stated to be 150 mph. Stall speed is 50 mph. Economical cruise speed range is 1,000 mi. Optional equipment includes constant-speed prop and VHF transceiver with omnirange. Retractable tricycle gear is manually operated.

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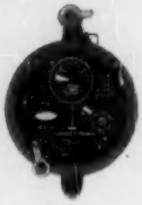

OXYGEN REGULATOR
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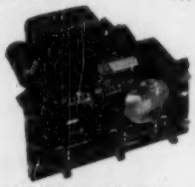
OXYGEN REGULATOR
Type 2893



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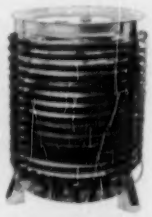

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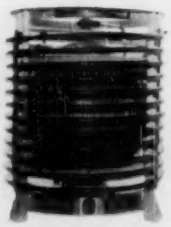

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CAB Cuts Mail Pay Of Three Carriers

Mail pay for Braniff Airways, Pan American-Grace Airways and Alaska Airlines has been cut by the Civil Aeronautics Board to reflect recent reductions in breakeven need.

All three carriers are on temporary rates, and the Board has made the reductions in line with its policy of setting temporary rates sufficient to cover only breakeven need.

Panagra, whose current temporary rate produces $2,290,000 a year, will operate with annual mail pay of $393,000 after Jan. 1, 1955. Braniff's mail pay is reduced from $1,774,000 to $1,139,000 a year after Jan. 1, 1955 for Latin American operations. For domestic operations, the carrier will be paid at the service rate established for trunklines.

Alaska Airlines' mail pay would be reduced from $2,511,000 to $2,117,790, effective Jan. 1, 1955.

Airline Wins Round In Fight Over Name

North American Airlines won a round in its legal fight to keep its name when the U. S. Court of Appeals reversed a Civil Aeronautics Board decision which denied the nonscheduled carrier use of the name North American Airlines.

American Airlines contended in the case that North American was infringing on the established name of American. The court agreed with the findings of the examiner in the CAB investigation that "there is no evidence of record that North American adopted its name with intent to deceive the public or trade upon the good-will and business reputation of American, or that American has been injured by such operation. . . ."

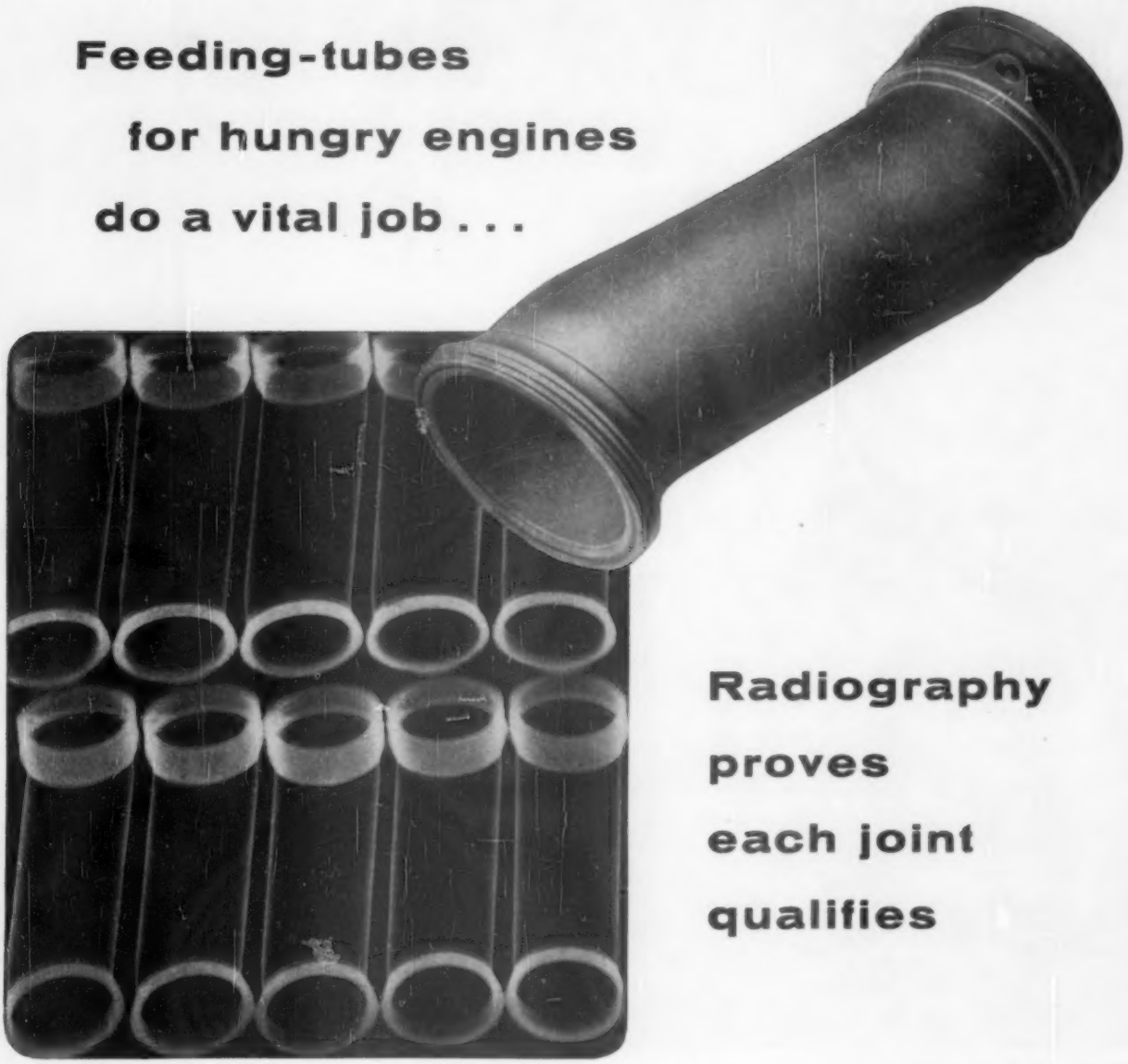
North American is now awaiting a decision in a similar case brought in California by North American Aviation.

New Crash Barriers

Three runway crash barriers, remotely controlled from the tower, have been installed on Republic Aviation's airfield at Farmingdale, N. Y. They can stop an F-84F Thunderstreak, going 150 mph., in about 600 ft.—roughly half the distance needed to brake the plane to a halt.

When the control tower operator activates system, two 6-ft. hinged steel posts rise on each side of the runway, supporting a nylon and canvas net which is attached to heavy anchor chain. Cost was $125,000. Similar system was used to stop Air Force jets in Korea (AW 6/15/53, p. 18; 7/13/53, p. 21).

Feeding-tubes for hungry engines do a vital job . . .



Radiography proves each joint qualifies

GETTING the food and drink to the several thousand "metal horses" in a modern aircraft engine is no job to be taken lightly. Dependability is paramount. Safety a must. And lightness a prerequisite.

Joining these vital feed lines is a job for welding and brazing. And with radiography to prove each joint sound, there can be no dispute as to the acceptability of the work.

Here again, radiography has greatly extended the fields where welding can be used. It can bring you new business, too. To explore what radiography can do for you, get in touch with your x-ray dealer and talk it over.

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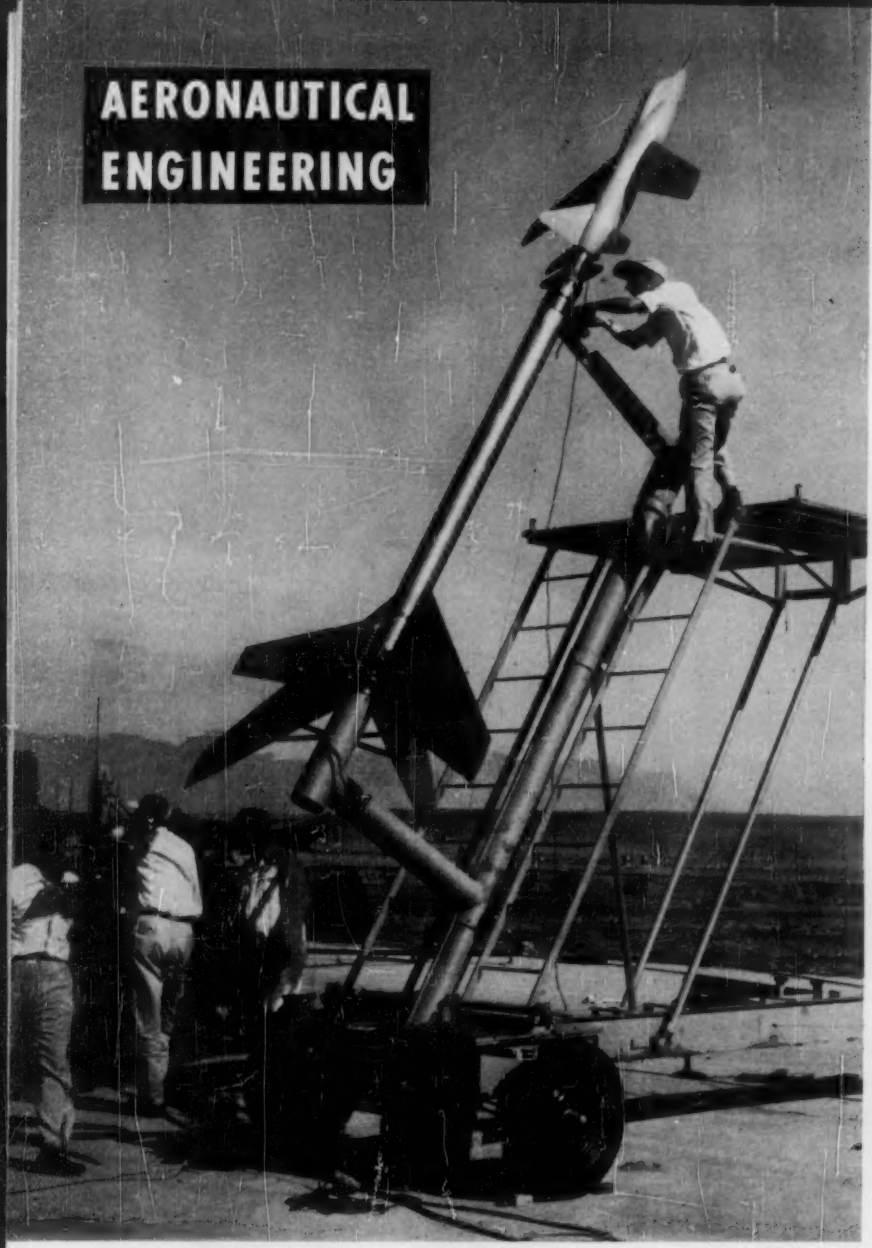
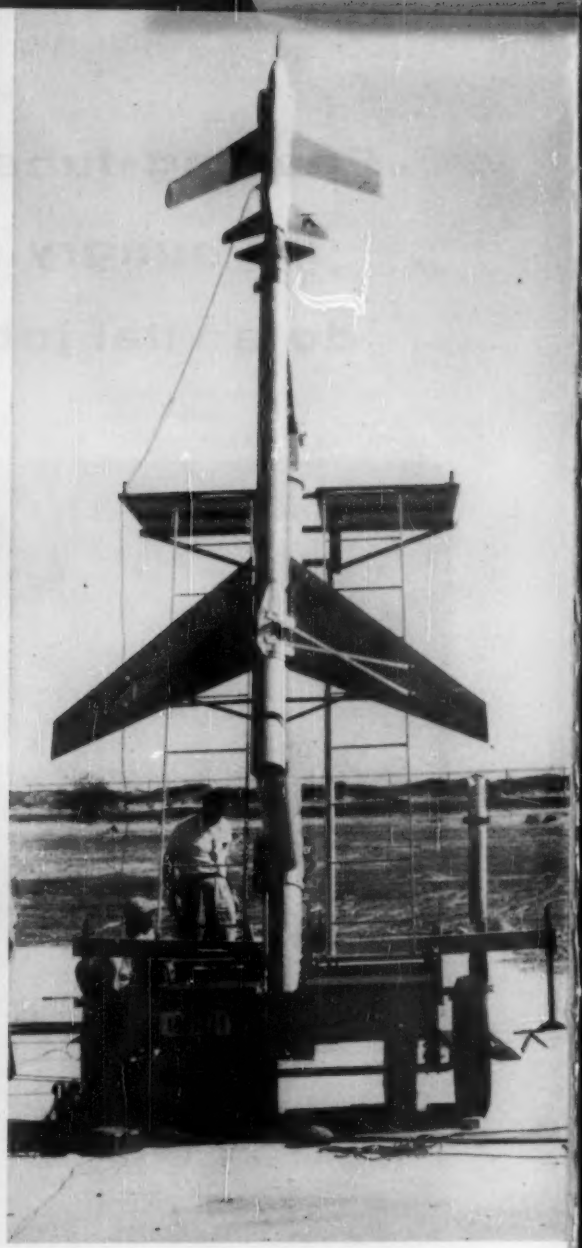




GRUMMAN TIGER MODEL gets check by Aerolab Development Corp. crew before free-flight test of supersonic fighter characteristics.

Supersonic Models Provide

A small supersonic model of a new aircraft streaks into the hot sky above New Mexico's White Sands Proving Grounds. Pushing the model at ever increasing speed is a booster rocket.

Tracking devices follow the tiny model across the sky as its transmitters send out vital information to receivers on the ground.

This is a relatively new research tool in probing the unknown areas beyond the speed of sound. In the area above Mach 1, the knowledge of aircraft designers reaches only so far. Wind tunnel testing in the supersonic ranges does not always produce the data desired. One answer to this is to supplement wind tunnel tests with free flight testing of rocket-propelled models.

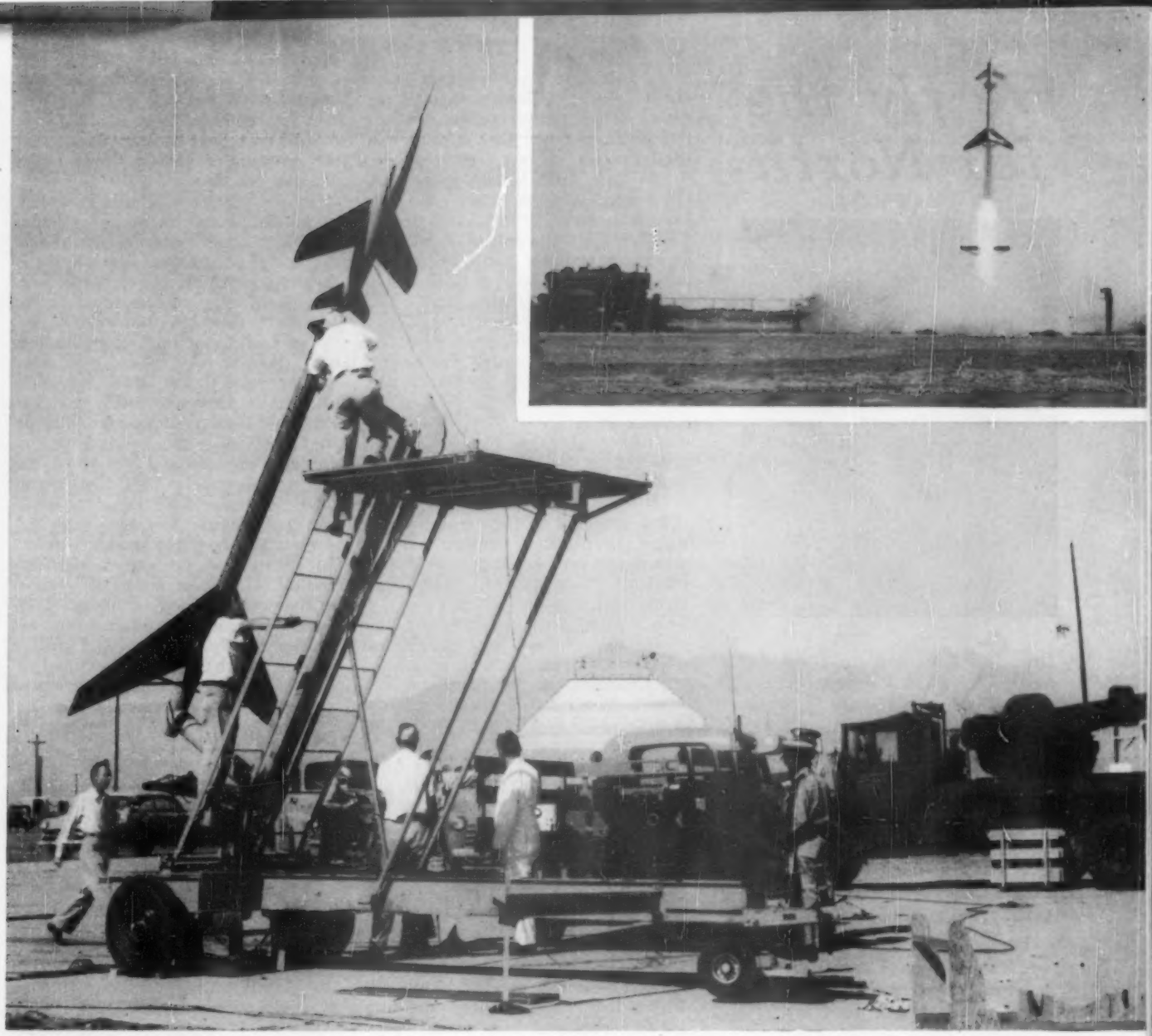
National Advisory Committee for Aeronautics pioneered techniques in this field. Convair, Lockheed, and other manufacturers have done a great deal of free flight research with models.

By William J. Coughlin

Pasadena, Calif.—Aerolab Development Corp. is offering airframe manufacturers a commercial package for free-flight testing of their new supersonic designs, either aircraft or missile.

The package includes design, construction and instrumentation of the test models, firing, data collection and reduction.

Aerolab says it can deliver a project's final report within six months from the time it starts work on the model. The free-flight data compares favorably with both wind tunnel and actual aircraft performance, according to company



SIMPLE CONFIGURATION can be expanded to take booster up to size of Nike unit. Tests take place at White Sands Proving Ground.

Missile Design Shortcuts

president E. G. Crofut. "We are willing to guarantee accuracy of the data within 5%," he says.

Data is obtained by telemetering as well as ground tracking. This raw data is sent to the airframe company together with the Aerolab report so the designers themselves can interpolate it in terms of the final airplane if they desire.

"We do not make a practice of telling the manufacturer what his drag coefficient is and then arguing about it," says Crofut. "We tell him what it is on the basis of our data reduction and he can use the raw data to apply as he sees fit."

In some cases, the prime company never sees either the model or the test, but only the final report and raw test data. Configurations tested and test values are among the most closely guarded secrets in the industry—not only for reasons of military security but also for competitive reasons.

"One of the best uses of the free flight technique," says Crofut, "is in design competitions. In a competition for a military aircraft, the government wants some performance estimates. The company that comes through with some test data and drag coefficients and has some actual free flight test data is in a stronger position. He is better than a man with just an estimate. This is where we really come in.

"In a big competition, it may take six months to write the proposal. We can give a customer actual data within six months while he still is generating the proposal."

Rocket-Powered Models

Aerolab has built several models which contain their own rocket powerplants. One of the problems in wind tunnel testing is accurate measurement of the effect of induced flow around the tail of an aircraft. By the use of small rocket engines, Aerolab can simulate the actual flow out of tailpipes or na-

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celles and determine its effect upon tail surfaces. This measurement of the effects of jet thrust can be done in free flight in a way that it cannot in wind tunnels.

The sleek little Aerolab models are constructed with the same care and close tolerances as the original design. The Aerolab shops remind a visitor of an aircraft assembly line in miniature. A typical model is made of brass, Dural, steel, and laminated glass cloth. The aft fuselage is machined from a heat-treated steel tube; the forward fuselage from aluminum castings. Wings and tail are machined from aluminum plate. The glass cloth laminate is used for fuselage skins.

Gross weight of a typical model is over 100 lb. Weight tolerance on a model of this size is held to within 2 lb.

If a model is too heavy, it will not reach its planned terminal velocity with the booster specified for it. If it is too light, the model will break up in flight.

Tolerances are held within a few thousandths on the critical leading edge sections. Templates used are much the same as on the full-scale aircraft.

Instrumentation of the model is a complex job.

"Some of our instrumentation is strictly artistic," says Hal Halsted, Aerolab's engineering manager. "There has not been enough work done in this field to make a science of it. This is a different job than instrumenting a missile. These models are not simple. They may look simple but they can be very complex. If you overlook something, it can cost you your whole program."

A model might contain axial accelerometers, normal accelerometer, free stream total pressure gage, duct total pressure gage and base pressure gage. In addition, there would be oscillators for each of these transducers, a battery pack, transmitter, nose antenna and related wiring.

Flight Tests

Firing of the rocket models at White Sands is much like the firing of more conventional missiles.

The Aerolab models are scaled to fit existing boosters from the size of HVAR up to the Nike, depending upon the desired Mach number and scale and upon the availability of the booster.

Connections between the booster and the model are highly stressed by the heavy loads of from 20 to 40G acceleration on firing. This presents certain problems in modifying the case of the booster.

"In one program," says Crofut, "we had to weld pieces to the case of the booster—the booster rocket had to be degrained at the arsenal, the case sent out to us for welding, and then sent back to the arsenal to be reloaded."

Solid propellant boosters also present the problem of varying thrust under different conditions.

To overcome these problems, Aerolab is considering construction of a liquid propellant booster which would enable the test crew to carefully select the thrust and end Mach number desired. One disadvantage of this would be the cost due to increased complexity.

"Its value goes up," Crofut points out. "So you have to add a recovery system. Nevertheless, there might be justification for a recoverable model as well as a recoverable booster. Reason we haven't done this so far is that it increases the size and weight of the model and you have to have bigger solid boosters. With liquid boosters, one could achieve this more easily."

Prior to firing, the model is tested by vibrating it to levels which the booster will impose and by dropping it to simulate the shock of firing. Telemetering circuits and pressure lines are checked. Then it is installed on the booster, which already is mounted on the launcher. The launcher is elevated and countdown begins.

Data Collection

During flight, the model is tracked from the ground by radar and multiple phototheodolites; its velocity is measured by a Doppler velocimeter. Ground stations pick up the data telemetered from the streaking model.

The rocket boosts the model to a velocity in excess of the desired test velocity and the two vehicles then separate.

The model coasts and decelerates after separation—perhaps down through a desired test range of Mach 1.6 to Mach 0.8—meanwhile sending out the data being recorded in waving lines far below. Then like its bigger brothers, it disintegrates against the floor of the desert test range. But even this final destruction is of value. Its impact point provides information which can be used in analyzing the trajectory.

Then begins the job of reducing the data. Delivery of the final report to the customer follows. Crofut reports that the company has completed "more than a few" contracts involving both drag and stability reports without any failures during firing or in intelligence transmission.

"The data produced by the tests has been good," he says.

Aerolab has fired both semi-scale and full-scale missile models for drag and stability testing. The company has developed a gyro-stabilized roll-rate control system that ties into the surfaces of the missile to keep it from spinning beyond the desired rate. Crofut be-

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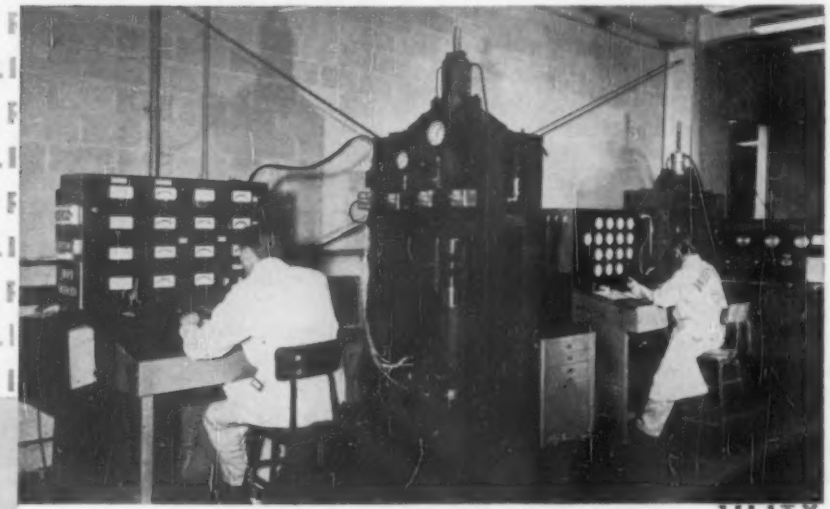

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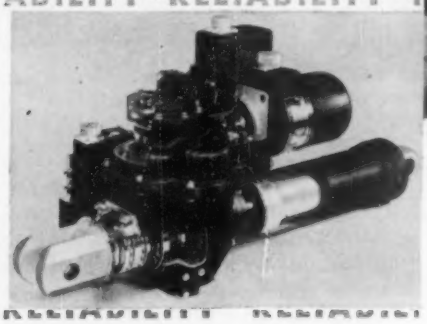

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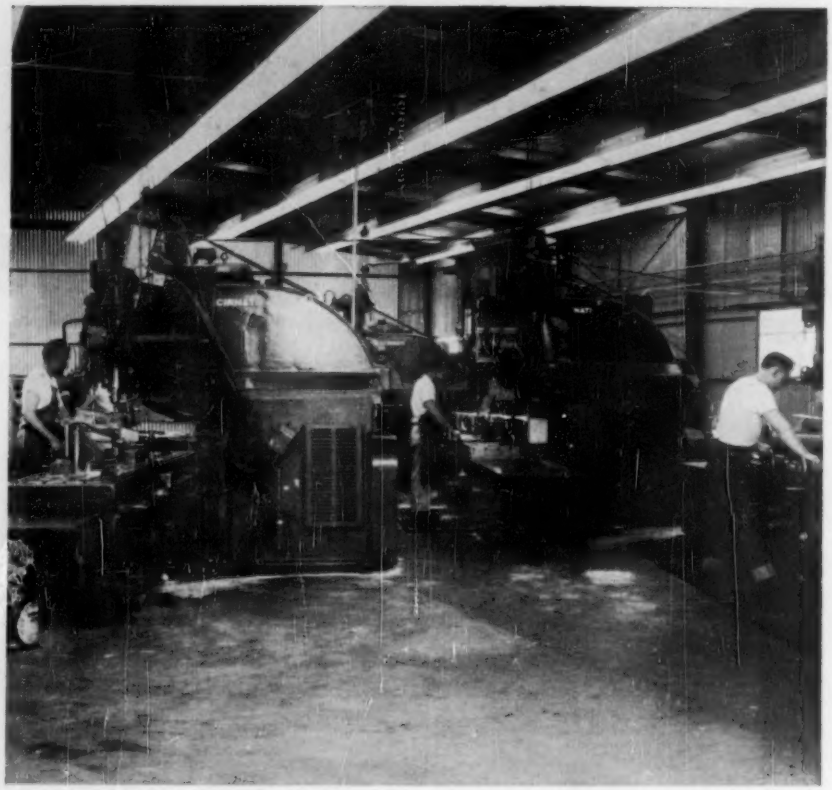
▸ History—From a small repair shop started in 1908 Loud has grown into one of the most completely equipped job machine shops in Southern California. This modern plant, including engineering and test laboratories, occupies almost two hundred thousand square feet and employs approximately seven hundred persons.

▸ Facilities—Within this modern completely equipped plant fabrication of the smallest precision valves to the largest aircraft structural fitting is accomplished. Loud is one of the very few plants equipped to handle all phases of manufacture from raw material to finished product in one plant. One of the largest milling departments in the West contains forty large mills, over 10 of which are of the Hydrotel automatic duplicating type. Other unusual equipment includes flash welders—one an 800 KVA giant capable of up to 12 square inches of chrome moly up to 10 inches in diameter; complete heat treating facilities including a 10 foot deep vertical atmospheric controlled furnace (necessary for the production of highly stressed arresting hooks); automatic duplicating lathes, automatic chucking lathes, qualified spot welding machines, complete qualified plating facilities including hard chrome, anodizing, cadmium, silver, copper, and dichromate (for magnesium); all types of grinding and honing machines, and the finest of inspection tools such as comparators and surface analyzers.

In addition to this unusual equipment the plant contains a multitude of turret lathes, hand screw machines, automatic screw machines, engine lathes, drill presses—some automatic indexing, large radial drills, boring machines, shapers, and planers. Complete qualified facilities for arc, oxy-acetylene, and heli-arc welding of steel and aluminum are provided.



ONE OF THE LARGEST milling departments in the West contains forty large mills, over 10 of which are of the Hydrotel automatic duplicating type.

These facilities make Loud an outstanding source for major sub-assemblies of aircraft.

With this complete manufacturing facility in one plant Loud can produce major structural sub-assemblies. An assembly line for the production of tactical ground handling equipment is currently turning out jet engine cradles in large quantities.

▸ Products—Loud produces complicated structural fittings of both steel and dural, all types of machined parts—large and small, hydraulic cylinders, valves, hand pumps, servo-control mechanisms, pressure tanks, landing gear struts, nose wheel steering units, pneumatic and fuel valves and filters, all to exacting aircraft specifications.

▸ Progressive—Loud's modern manufacturing facilities are constantly being expanded to meet the increased aircraft demands for quality and economy. This has resulted in the ability to produce precision machined products of the highest quality at a lower price than can be produced by the customers themselves.

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- **Resident Sales Engineers located in Seattle, Wash.; Kansas City (Independence), Mo.; Baltimore, Md.**

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lieves this cheap, expendable system may have applications for general use in missile testing.

How It Began

Aerolab, which also makes wind tunnels and target drones (AW May 16, p. 55), got into the model test business by stages. When Aerolab heard in 1948 that NACA was asking airframe plants to bid on free flight models, the company asked for the drawings and joined in the bidding. Aerolab submitted what it believed was a very high bid.

The company quickly learned a pleasing lesson about the economics of model-building: Its bid for six models was $36,000. Next closest bid was $88,000.

"We got the business and made 100% profit," Crofut says.

The company won a number of other NACA competitions. Then the whole bidding scale began to drop as NACA brought more small companies into the competition. "Aerolab hasn't won an NACA fabrication bid for some time now," the company's president admits.

From building models of NACA designs, the next step was into actual design work. Crofut convinced NACA that Aerolab should have a design contract.

"We put in an engineering department and lost our shirt," Crofut recalls. "We dropped $50,000. But we learned how."

The company then decided to expand into testing so that it could integrate the whole package. A classified government contract put the firm into the testing end of the business and today Aerolab can offer complete design, manufacturing and testing facilities for rocket-propelled models.

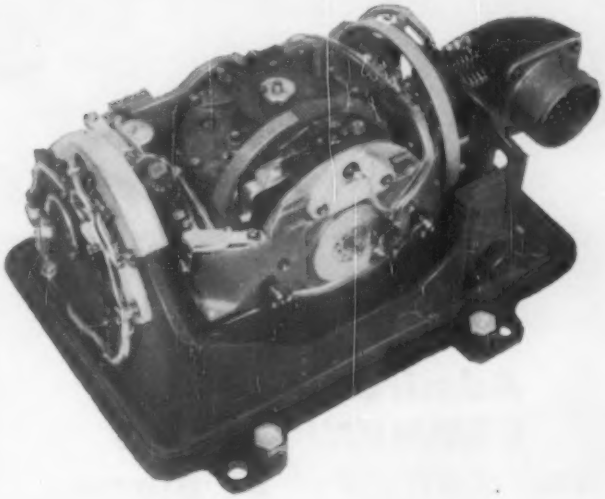
By integrating the entire operation, Aerolab believes it can offer a saving in both time and money that airframe manufacturers cannot match in their own plants.

"We are not worried about big airframe companies invading this field because it doesn't make sense," says Crofut. "It is ridiculous for a contractor to take on the problem of supplying his own free flight data when we can do it for him at less cost and in less time. He just doesn't have enough work to have a special department for this."

Aerolab, which hires 65 employes, is looking forward to sales of some $250,000 in the first quarter of fiscal 1956. This is due largely to a contract the company has for radio-controlled target drones.

But as the industry probes deeper into supersonic flight, Crofut expects free flight testing of rocket-propelled models to play a bigger role in the company's future.

A companion for our famous cageable vertical gyro!



Honeywell has a new vertical gyro – simple, rugged and accurate!

HONEYWELL has developed a new non-cageable vertical gyro, the GG33, designed to even higher standards of ruggedness and accuracy than its famous predecessor—the JG7003, heart of the earlier Honeywell Autopilots.

If your gyro needs don't call for caging (for that you'd want the Honeywell JG7044) you'll definitely want to investigate the features of the new Honeywell GG33.

This two-axis vertical reference gyro, with a pitch freedom of ±85° and a roll freedom of ±165° minimum is designed for potentiometer output. The values of these potentiometers can be varied considerably to meet your particular application.

The specifications on the new Honeywell GG33 are detailed below. For further information, and for information on the full line of Honeywell Gyros, write to: Honeywell Aero Division, Dept. AW-7-112, Minneapolis 13, Minnesota.

Specifications of the new Honeywell GG33 Vertical Gyro

Power Requirements—Gyro Motor: 115 V, 400 CPS ± 10%, single phase. Erection Motors: 26 V, 400 CPS, single phase.

Power Load: Gyro Motor: 50 watts max. (starting); 20 watts max. (running).
Erection Motors: 5 watts each.

Gyro Speed: 22,000 rpm (min.)

Angular Momentum: 4.75 x 10^6 gm-cm²/sec.

Roll Axis Freedom: ±165° (min.)

Pitch Axis Freedom: ± 85°.

Gyro Rundown Time: 8 min. (min.)

Erection Rate: 2° to 6° per min. (normal factory adjustment).

Drift Rate: ½°/min. (max.)

Accuracy: 0.15 degrees of true vertical in each axis.

Output: potentiometer signal.

Weight: 5 lbs. max.

Time for Usable Gyro Signal: 1 min. after application of power.

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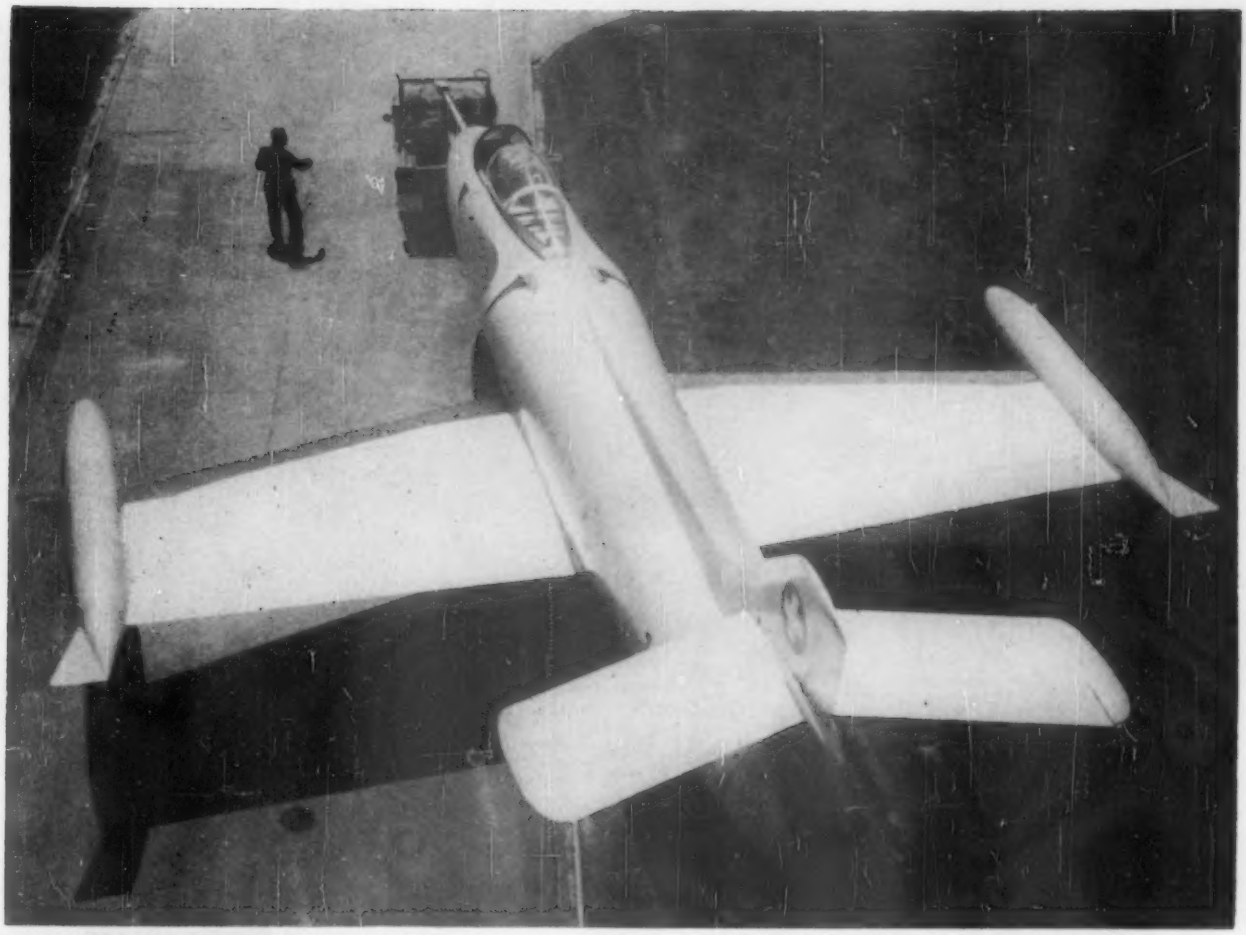


NEW SWISS P.16 GROUND-SUPPORT FIGHTER is a conventional plane with thin straight wing and swept variable-incidence tail.

CANNON-ARMED P.16 was designed for operation from rugged Swiss terrain. It is powered by an Armstrong Siddeley Sapphire turbojet.

First Swiss-Built Jet Makes Initial Flight

A thin straight wing of large area is the key design feature of the new Swiss FFA P.16 ground-support fighter, which made its first flight Apr. 28. Powered by an Armstrong Siddeley Sapphire, the P.16 is intended for shoft-field operations in mountainous Switzerland. (AW Jan. 3, p. 24; Apr. 25, p. 7).

Armament is a pair of 30-mm. Oerlikon 302 RK revolver cannon with a rate of fire up to 1,200 rounds per minute and a muzzle velocity of 3,600 fps. Extended stores, including rocket packages, add to its offensive punch.

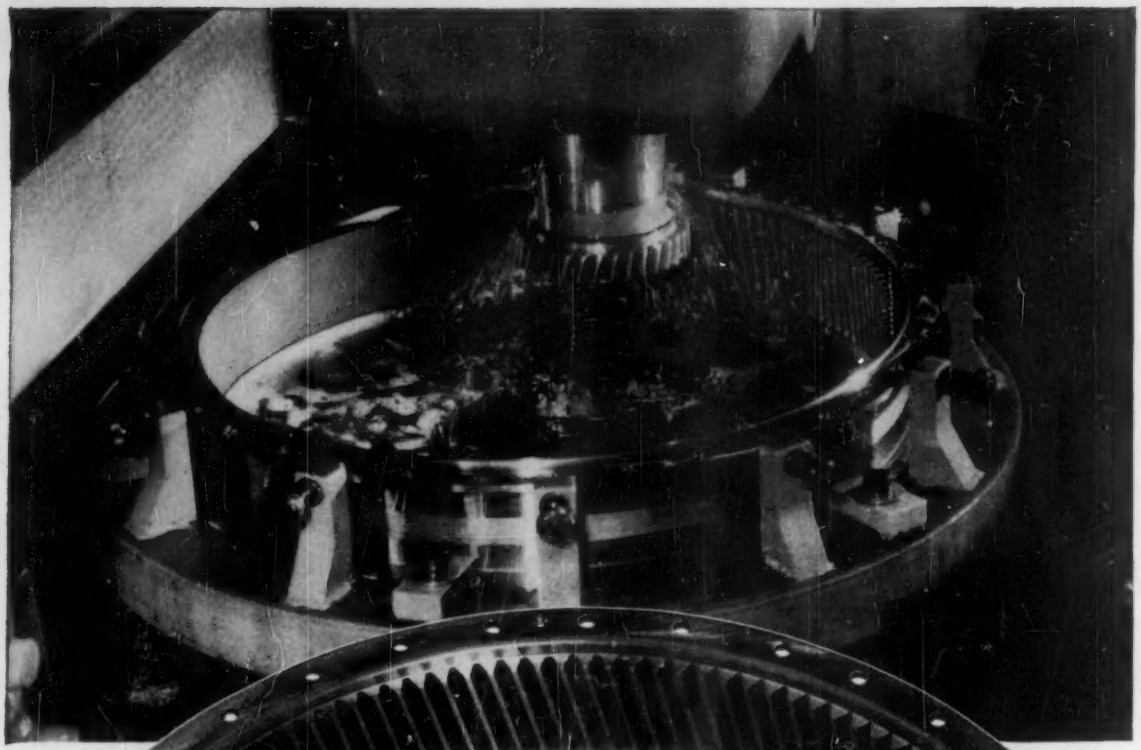
The P.16 is the first Swiss-designed and -built jet aircraft. Its developers—Flug- & Fahrzeugwerke A. G.—have been producing the de Havilland Vampire and Venom under license from the British firm. Both DH planes are standard units of the Swiss air force.

The P.16 is a conventional airplane with clean lines. Dominating the design is the ample knife-edge, thin wing. Wingtip tanks, placed well forward, help counter any tendencies of the thin surface to flutter. Flaps and ailerons are conventional.

The high-mounted tail is swept back moderately, and is a variable-incidence type. The dorsal fin runs far forward on the fuselage and may be a spine for control lines to the tail.

Technical backup for the Swiss fighter can be traced through FFA—formerly a Swiss branch of the German Dornier

and then we built



This 7 pitch, 19.1564″ pitch diameter internal gear for the Sikorsky S-58 Main Transmission

This HARD (Rockwell "50C") gear is cut after heat treating to master gear standards:

.0002″ per inch maximum lead error
+.0000 −.0003 involute error
.0002″ tooth spacing tolerance
60 RMS finish

INDIANA GEAR

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firm—to outstanding theoretical work done in the Swiss Federal Institute of Technology's Institute of Aerodynamics under Dr. Jacob Ackeret. His recent work has included the development of a thrust-reverser for turbojets and extensive experiments in boundary-layer control, both desirable additions to an airplane that must operate from the 3,000-ft. mountain strips common in Switzerland.

Observers believe the Swiss may try to sell the airplane to the new German Luftwaffe for its ground-support wings. They cite the former connection between FFA and Dornier, plus the availability of the design and production space.

USAF Contracts

Following is a list of recent contracts announced by the United States Air Force:

Abrams Instrument Corp., Lansing, Mich., intervalometer, 106 ea., automatic exposure control spare, tools and data, 237 ea., $290,479.

Aerojet-General Corp., Azusa, Calif., advance engineering design and architectural services for construction of pilot production and production testing facilities for project MX 1593, $200,000.

American Hydrotherm Corp., Long Island City, N. Y., operate, supervise and maintain central heating and distribution system, job, $75,672.

Avco Mfg. Corp., Lycoming Div., Stratford, Conn., R1820-103 engine special tools, 114 ea., $2,638,104; R1820 engine special tools, $44,397.

Avco Mfg. Corp., Crosley Div., Cincinnati 15, Ohio, modification of B/TB-29 aircraft, safety of flight maintenance of B/TB-29 aircraft, correction of prototype, $357,638.

Bell and Howell Co., Chicago, spare parts for N-9 camera, $43,111.

Bendix Aviation Corp., Red Bank Div., Eatontown, N. J., generators, engine driven, 592 ea., $242,447.

Bendix Aviation Corp., Eclipse-Pioneer Div., Teterboro, N. J., transmitter, fuel flow rate, 2,562 ea., $473,970.

Burton Mfg. Co., Los Angeles, Calif., indicator, tachometer, $68,887.

Curtiss-Wright Corp., Propeller Div., Caldwell, N. J., additional funds for special tools and CCN, $162,281.

Fairchild Aircraft Div., Fairchild Engine and Airplane Corp., Hagerstown, Md., procurement of C-123-B-1 MTU to represent C-123B airplane, 1 ea., $45,000.

General Electric Co., Utica, N. Y., transmitting set, countermeasures, 460 ea., transmitter group, 800 ea., 100 ea., $7,046,104.

General Electric Co., Schenectady, N. Y., generators, a.c., regulators, voltage panel control, automatic, $1,503,471; indicators, tachometer, 971 ea., $72,698.

General Motors Corp., Buick Motor Div., Flint 2, Mich., modification of J65-B3 engines, 383 ea., $594,799.

Goodyear Tire and Rubber Co., Akron 16, Ohio, wheel assy., 40 ea., 40 ea., brake assy., 40 ea., $40,606.

Kearfott Co., Inc., Engineering Div., Clifton, N. J., amplifier, indicator, spare parts and data, $119,000.

Kearfott Co., Inc., Little Falls, N. J., spare parts and packaging, $862,072.

Remler Co., Ltd., San Francisco, Calif., FM panels, 79 ea., voltage regulator panels, 269 ea., FM panels, 269 ea., $45,966.

Lear, Inc., Grand Rapids, Mich., drum and bracket assys., 2,325 ea., switches, engaging, 1,077 ea., network phase changing, 201 ea., $228,939.

Boyd T. Hetrick, d.b.a., Harrisburg Upholstering, Cameron and Mulberry Sts., Harrisburg, Pa., overhaul and repair of engine containers, 1,017 ea., $67,070.

NOW A 1/4" DIAMETER SEAMLESS METAL BELLOWS

Bridgeport Thermostat's broad experience in bellows engineering now makes available 1/4" and 5/16" diameter bellows. Ideally suited to miniaturization, these tiny units are produced in a wide range of characteristics and metals. Bridgeport specializes in metal bellows and complete bellows assemblies of all types and sizes. Send for new bellows engineering data—use handy coupon below.

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Send me the Bridgeport bellows data checked below: (Dept. NA)

☐ Full details on new, small-diameter bellows

☐ Bellows Engineering Bulletin #125 (28 pages)

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Nike Goes Into Action Quickly In Arctic Test

Arctic tests of the Nike surface-to-air missile system have proved the weapon can be put into action quickly in low-temperature environments.

In addition to weapon effectiveness, the tests were aimed at determining roadability of the units. Schedules included moving all equipment into and out of action, preparing launching sites and machinery and determining the time and accuracy of checkout and adjustments on the radar gear.

Tests were made by 44 U. S.-trained personnel from the Royal Canadian Artillery, assisted by a five-man unit of the Royal Canadian Electrical and Mechanical Engineers. Canadian and U. S. observers were present. Operations were centered in Canada's sub-Arctic, a few miles from Churchill, Manitoba.

Operation began last November with Arctic indoctrination for the teams, and elementary tests on the equipment. The heavy test schedule began early this year and was completed in March. Announcement of the results was withheld until recently because of security.

Canadian sources say radar trackers and computers worked well in the extreme cold and that launchers and missiles could be put into action quickly.

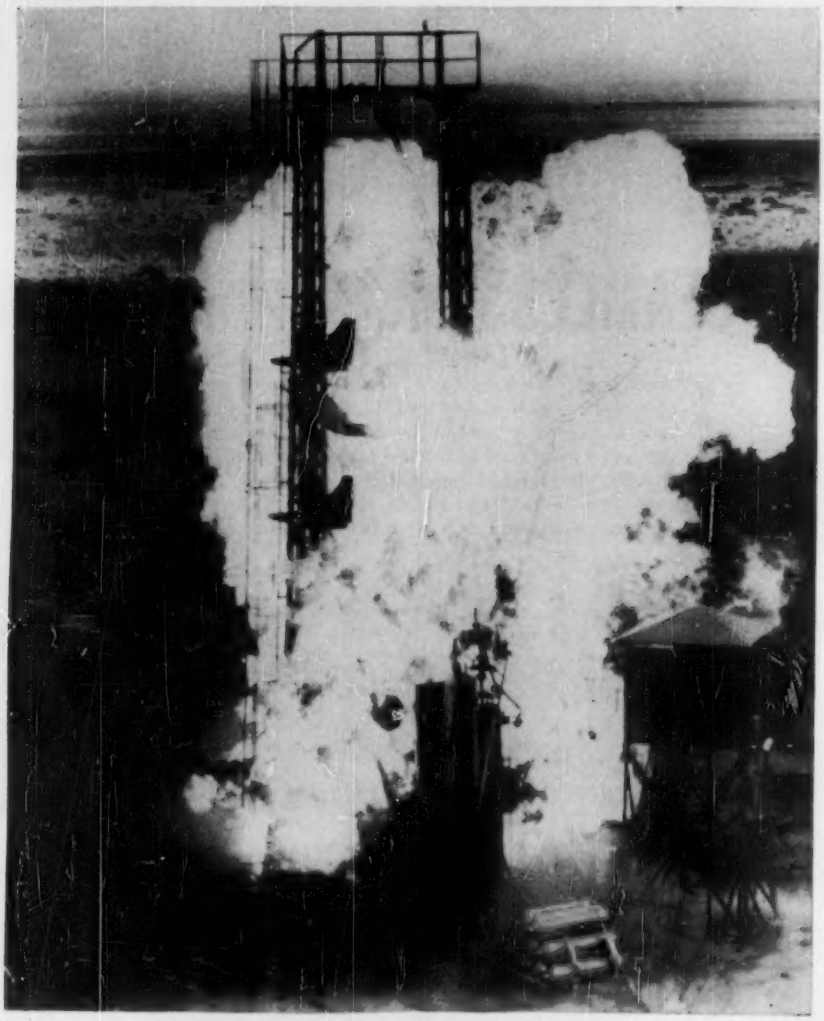
Permanent Seminar On Plastic Tooling

A permanent seminar on plastic tooling has been established at the New England Seminar of Tooling, Edgartown, Mass.

Three programs—elemental, standard, and extended—are offered at rates varying from $150 for the complete elemental course to $20 per day for the extended.

The elemental course, four days long, is aimed at providing basic working knowledge on the use of plastics in tooling. The standard course follows for five days, and covers advanced training and specific applications of plastic tooling.

The extended course is planned for manufacturers and engineers who need long-range assistance in setting up large tooling programs, or who want to prepare for a career in the field.



The One That Didn't Get Away

Did you ever have one of those days when everything seems to go wrong? This was one of them. There was the missile, tied down to the 100,000-lb. test stand at White Sands, everything finally checked out and ready for static firing. We heard the count-down and the next thing we knew. . . .

Degree Offered to Nuclear Engineers

A two-semester nuclear engineering course, leading to a master's degree, is being offered by the University of California at Berkeley.

Emphasis will be on nuclear power system, with studies in analysis, design, performance prediction and cost. Weekly seminar sessions will supplement the program, and will feature outside speakers of the caliber of Drs. E. Teller, E. O. Lawrence, and H. F. York. The reactor at Livermore—University of California Radiation Laboratory—will be used during the program.

Prerequisite for the course is a completed curriculum in engineering or physics. For further information: Prof. E. D. Howe, Chairman of Mechanical Engineering, University of California, Berkeley, Calif.

AF To Link Defense Units by Leased Lines

A $2 billion project to speed the U. S. air defense communications system has been started by the Air Force.

SAGE—Semi-Automatic Ground Environmental System—is designed to replace the manually operated system now in use to link radar outposts to control points, fighter units and guided missile battalions. It will involve, eventually, the leasing of private equipment from telephone companies at an annual cost of about $240 million.

First details of the previously secret program were disclosed in hearings before the Defense Subcommittee of the Senate Appropriations Committee.

USAF program calls for the telephone companies to install the equipment and lease it to the Air Force, with the cost to be paid off over a 10-year agreement. SAGE system will require about 25,000 circuits as against 1,500 used in the present system.

The SAGE system will operate only in continental United States and will not be extended to the DEW—Distant Early Warning—line.

WHEREVER YOU FIND AIRPOWER, YOU'LL FIND LINK!

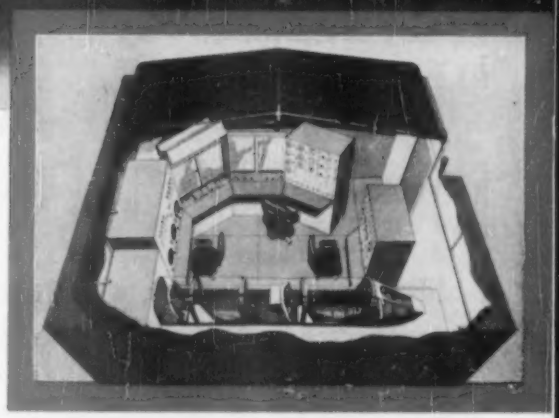
Meet one of the fightingest teams in our Air Defense Command!

Pilot and radarman of the Northrop F-89D Scorpion have difficult jobs to do, but they know their work well—long before they ever step inside their plane!

Rigorous training in Link's F-89D Jet Flight Simulator helps prepare both pilot and radarman simultaneously by duplicating on the ground the actual conditions they will meet when they fly their Scorpion.

Link precision engineering re-creates exactly typical combat problems, cross-country flight, rough air, crash static and many other in-flight conditions. And, more important, the Link F-89D simulator reproduces precisely the Scorpion's "X-ray eyes"—the amazingly accurate radar system for fire control that makes this plane one of our deadliest air weapons. "Targets" are tracked and destroyed, "enemy planes" intercepted in astonishingly realistic missions, electronically duplicated on the ground.

In this way, Link helps the ADC pilot and radarmen develop a working relationship with each other and with the mighty instrument of defense they will operate. Link helps them to work more efficiently, more effectively, in guarding America.



Fitting the sky between four walls, this Link F-89D Jet Flight Simulator, developed under Link basic patents, duplicates precisely the flight and radar characteristics of the Scorpion.

LINK INVITES APPLICATIONS FROM QUALIFIED ENGINEERS AND DRAFTSMEN.

LINK AVIATION, INC
BINGHAMTON—NEW YORK

A SUBSIDIARY OF GENERAL PRECISION EQUIPMENT CORPORATION

Manufacturers of world-famous Link trainers and simulators (such as F3D, B-47, F-89, F2H-2, F2H-3) • simulated aircraft instruments specialized computers • servo mechanisms • computer components gear boxes • friction over-drive clutches • precision potentiometers ratio voltmeters • phase angle meters • and other electronic devices

NAA F-86H can double as a fighter-bomber or air-superiority fighter, has "special weapons" capability.

Nellis Air Force Base reports:

"G.E.-POWERED F-86H HAS CLIMB RATE DOUBLE THAT OF THE F-86F"

Newest J73 jet engines have 50% more power in same frame size as J47 models

Just how fast the F-86H Sabre can climb was, until recently, undisclosed. But at Nellis AFB last January, the true potential of Tactical Air Command's "H" Sabre and its G-E J73 engine was revealed. An Air Force report stated:

"To compare the climb rate of the new *F-86H* (J73-GE-3 engine) with that of the *F-86F* (J47-GE-27 engine), we began by flying the 'H' at 3000 feet and an F-86F at 20,000 feet . . .

"Both planes were put into 'maximum climb' simultaneously. At 38,000 feet, the F-86H overtook and passed the 'F'. When the 'F' reached 39,000, the 'H' was at 40,000. At the end of the test, the 'H' was climbing at twice the rate of the 'F'. All told, the F-86H went up 37,000 feet in the same time it took the 'F' to travel 19,000!"

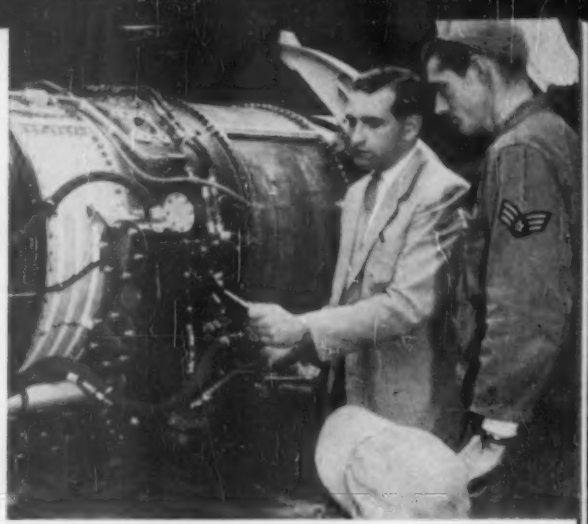
News? Yes—but not to North American Aviation and General Electric jet engineers. The 9000-lb thrust J73, 50% more powerful than the combat-proved J47, promises well as an operational F-86H engine. F-86H take-off distances are less; shorter runways can be used; all-around performance is improved over previous Sabre models.

General Electric progress in jet engine design is *continuous*. It is now—today—paying off in another advanced high-thrust engine, soon to power supersonic military aircraft. 232-7

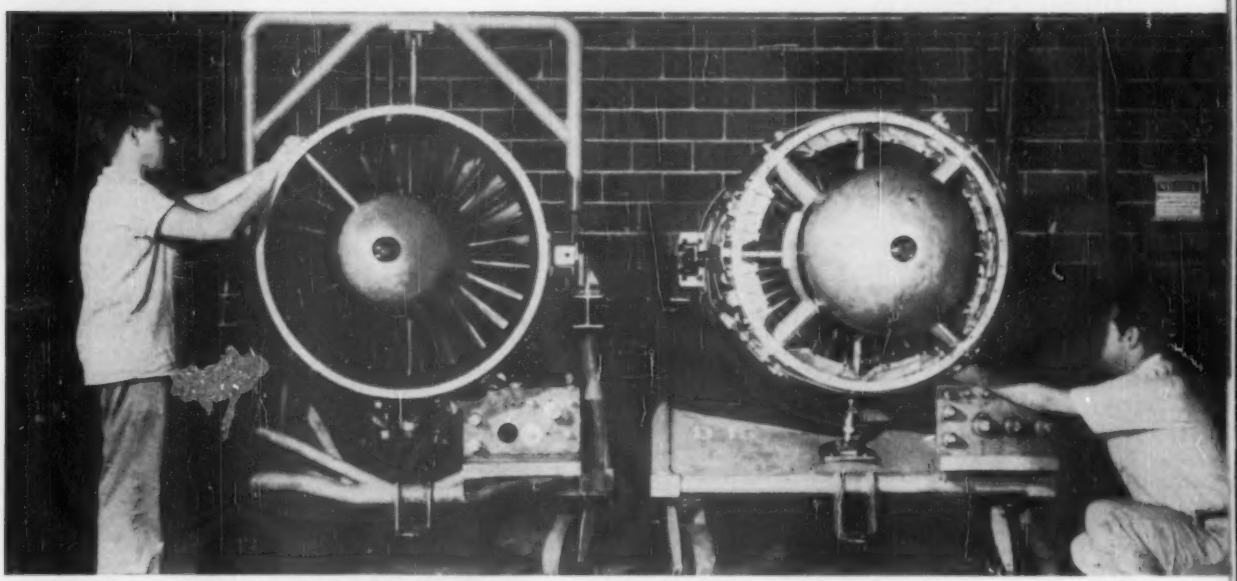
Progress Is Our Most Important Product

GENERAL ELECTRIC

J73 CANNULAR COMBUSTION SYSTEM is significant advance from J47's. It increases burning efficiency and structural rigidity, while saving weight.

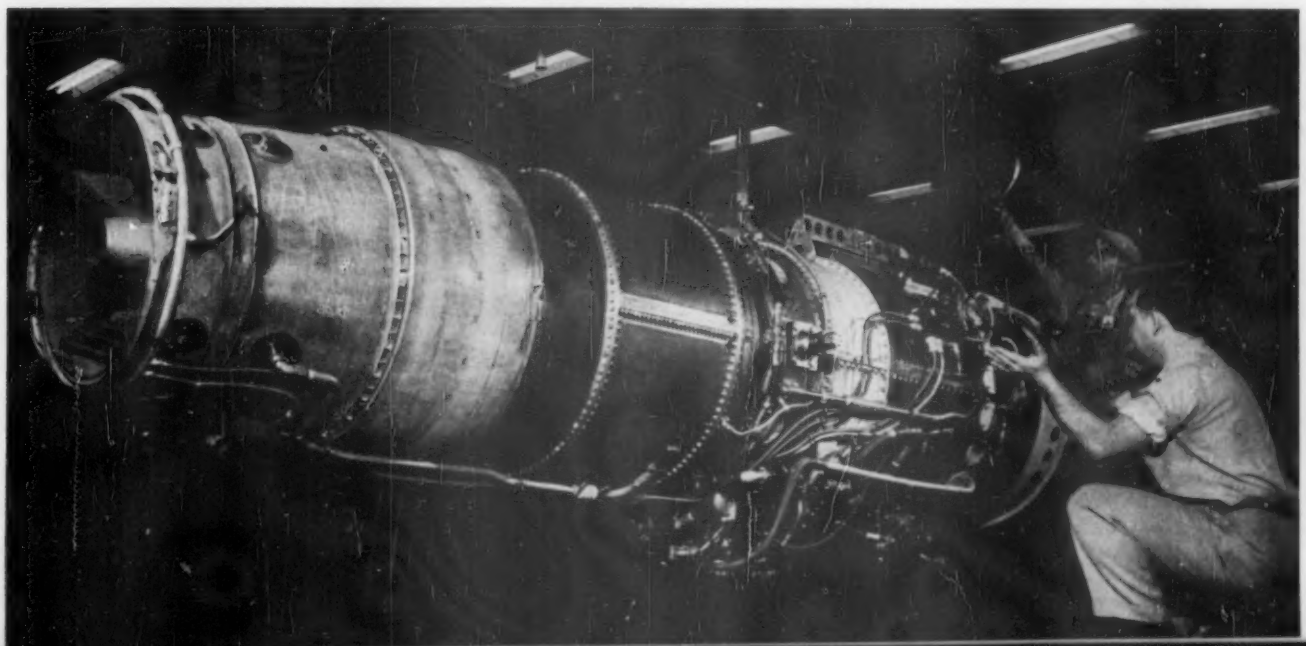


J73 ACCESSORIES—To simplify inspection and maintenance, J73 fuel pump, and gear assemblies are mounted beneath engine.



J73 FRONTAL AREA. Diameter of J73 (left) and J47 is about the same, but J73 has greater air intake area which allows more airflow through engine. Exposed J73 inlet surfaces are anti-iced.

OPERATIONAL SERVICE TESTS on G-E J73's show high reliability, low maintenance equal to G.E.'s famous combat-proved J47. J73 engines are rapidly accumulating flight time in the NAA F-86H.



Anti-Radiation Additive for Rubber

Early progress in extending the life of materials subject to atomic radiation has been reported by the B. F. Goodrich Research Center, Brecksville, Ohio.

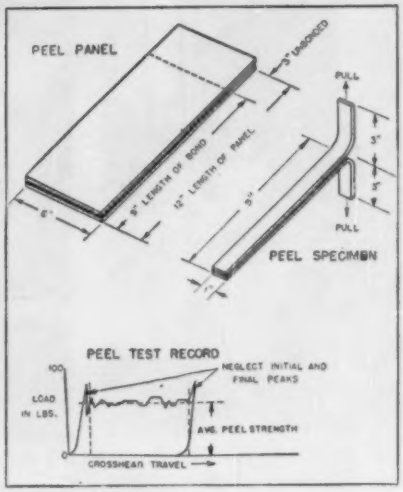
Materials called "anti-rads" have been developed to add to rubber stocks in process before vulcanization. Rubber products made from the processed stock will have a life expectancy in the presence of radiation about 10 times that of untreated rubber.

Some tests have been made with treated rubber in a cobalt-60 source shield at the research center.

Peel Test Checks Metal Adhesive

A new peel test for metal-bonding adhesives is being used by Douglas Aircraft Co., Santa Monica, Calif.

Adhesives to be tested are bonded to 0.032 gage clad 24ST3 aluminum alloy in 6x12-in. panels. These panels are bonded in a 6x9-in. area, leaving 3-in.-long unbonded portions at one end. The panels are then sheared in 1-in. widths and the unbonded ends bent by hand in opposite directions perpendicular to the plane of the bond.



During the test, the two 3-in.-long unbonded ends of the test panel are gripped in the jaws of a 5,000-lb.-capacity autographic recording laboratory Universal testing machine, made by Baldwin-Lima-Hamilton Corp. The specimen is pulled apart at a jaw separation rate of 2 fpm., separating the bond at 1 fpm.

The test record gives average peel strength in pounds per inch width of the specimen. Type of failure and average adhesive film thickness can also be observed from the test results.

THRUST & DRAG

Remember Comrade Mozhaisky than whom nobody earlier invented the airplane? His 130th birthday is coming up soon (he's not still living, by the way—how many deviationists are?) and the Russians are making big deal of it all. First, they plan to erect a bronze bust at Krasnoye Selo near Leningrad, where the first aircraft was built and flight-tested in the summer of 1882.

Second, the Red Banner Air Force Engineering Academy in Leningrad is being renamed after Mozhaisky.

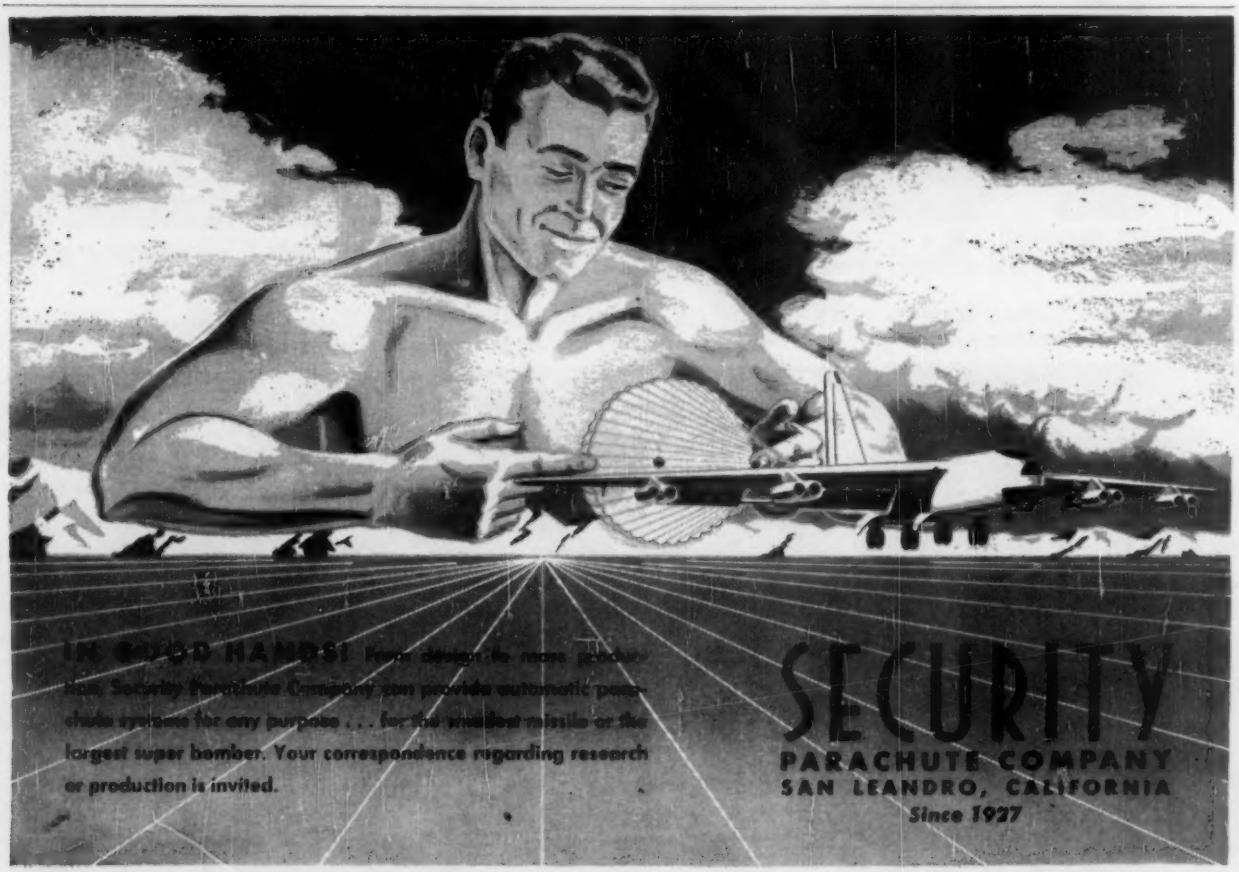
But poor Comrade M. never knew all this post-mortem glory that was to be his, nor did he ever get any rubles for his invention. Not for him was the Order of Lenin or a Hero of Socialist Labor decoration.

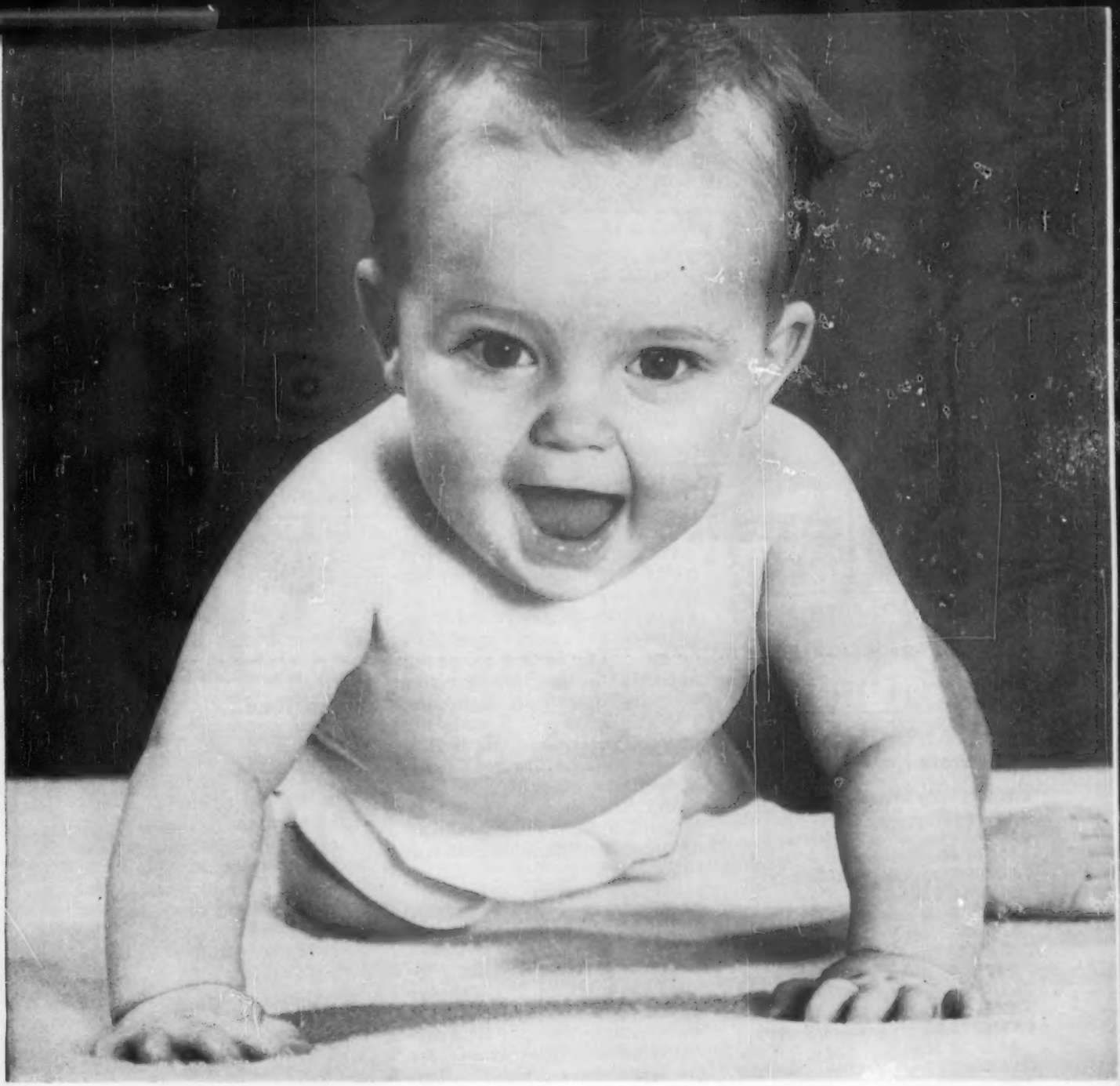
Thus, the honor was without profit in his own country.

* * *

Titles are as important to many engineers as the salary they receive (or don't receive). Two or three extra words after one's name are worth something to him, although management and he do not agree on the exact amount.

But how deplorable is the trend to lengthy titles. It is bad enough to have to write to an Assistant Chief Develop-



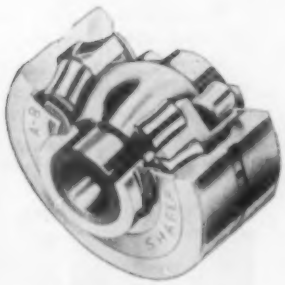


You Have to Crawl Before You Fly

On any new design you have to do a lot of crawling—through research, development and design—before your plans can fly.

It is in those early stages of design that Shafer Bearing Engineers have helped development of many of today's newest babies in the air. Shafer specialized bearing knowledge, plus the inherent flexibility of Shafer design, has saved valuable engineering time . . . saved space and weight in the finalized design . . . and saved time and expense in production man-hours.

Call, wire or write: Shafer Aircraft Bearing Division, 801 Burlington Ave., Downers Grove, Illinois. In the meantime, write for new full-color catalog No. 54.



ConCaVex Design...10° plus or minus self-alignment always available. . . . Easy relubrication without disassembly. . . . High radial and thrust load capacity. . . . Exceptional shock-load reserve strength.

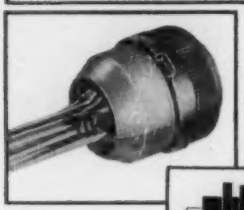
SHAFER BEARING DIVISION OF **CHAIN** BELT COMPANY

NEWEST METHOD OF SEALING AGAINST MOISTURE

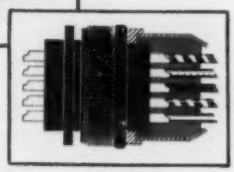
POTTING of Cannon Connectors

for...

1. ***Positive sealing*** against moisture, dirt, and other foreign matter.
2. ***Weight saving*** because of elimination of end bell and cable clamp.
3. ***Space saving*** due to shorter overall length.
4. ***Prevention of wire fatigue*** under extreme vibration.
5. ***Improved dielectric characteristics.***



Typical completed potted connector



Individual wires and elements are thoroughly sealed

CANNON offers these Connectors for Potting

CAO6BS Plug • Plastic Inserts 12S to 48 Sizes
CAO6BR Plug • Plastic Inserts 12S to 48 Sizes
CAO6ES Plug • Resilient Inserts 8S to 36 Sizes
CAO6ER Plug • Resilient Inserts 8S to 36 Sizes
CA3106BS Plug • Plastic Inserts 12S to 48 Sizes*
CA3106BR Plug • Plastic Inserts 12S to 48 Sizes*
CA3106ES Plug • Resilient Inserts 8S to 36 Sizes*
CA3106ER Plug • Resilient Inserts 8S to 36 Sizes*

**less grounding means*

Receptacles also available for potting.

Plugs and receptacles available with either pin or socket assemblies.

Please Note: Many other connectors may be potted by devising proper potting techniques.

CANNON Potting Molds

Nylon potting cup

Aluminum end bell

How It's Done...

Potting is a newly developed method of obtaining complete protection, covering, and sealing around the solder cups and wires at the rear of electric connectors by means of a sealing compound applied at the time the connectors are wired into their assemblies. The terminal area enclosed by the plug or receptacle end bell is filled or potted with a free flowing high solids synthetic rubber compound. This cures at room temperature to form a firm, resilient, moisture and vibration resistant rubber seal.

Clean the Connector...

The connector should be free of grease, oil and wax in order to insure good adhesion. Do not expose insulating materials to the cleaning solvent beyond the time necessary for adequate cleaning. *See the new Cannon Manual on Potting for complete information.*

Mixing the Compound...

Compounds are usually furnished as a basic sealant compound and an accelerator. Mixing must be done carefully, either by hand or with power equipment. *This subject is covered fully in new Cannon Manual on Potting.*

Applying the Sealant...

Application of the sealant can be made with a small paddle-shaped tool, spatula, putty knife or a flow gun. However, the flow gun is the preferred method where larger quantities of the plugs are to be sealed. *Methods are discussed fully in the new Cannon Manual on Potting.*

Potting Machines...

Large quantity runs can be handled economically by potting machines. Typical equipment of this nature is illustrated here.

Potting machine in use

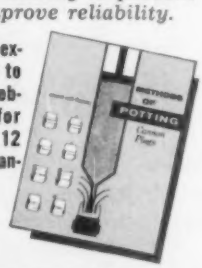
Potting by hand

Curing Time...

Curing time and the methods used are very important. The length of time that it takes for the sealant to harden and cure varies with the material used. Generally, the length of cure time depends upon the work life of the compound. A longer work life increases and short work life decreases the cure period. *See the new Cannon Potting Manual for complete details.*

MIL-S-8516 (Aer) is basic specification on sealing compounds for electric connectors and electric systems. BuAer Bulletin Aer-EL-35 covers electric connector sealing to prevent contamination, improve reliability.

Cannon's engineering experience is available to you on your potting problems. Write TODAY for assistance and for new 12 page, 2-color, Potting Manual No. PM-1.



40th YEAR 1915-1956 CANNON ELECTRIC

Please mention this magazine or Dept. 110

CANNON PLUGS

CANNON ELECTRIC CO., 3209 Humboldt St., Los Angeles 31, California. Factories in Los Angeles; East Haven; Toronto, Canada; London, England; Melbourne, Australia. Manufacturing licensees in Paris, France; Tokyo, Japan. Representatives in all principal cities.

ment Engineer (Airframes), but here's a worse one. One engineer known to us is Acting Sub-Section Group Leader, Thermodynamics, Fluid Flow and Heat Transfer, Rocket Section, Engineering Department. He's happy, but he's going to lose a lot of his correspondents.

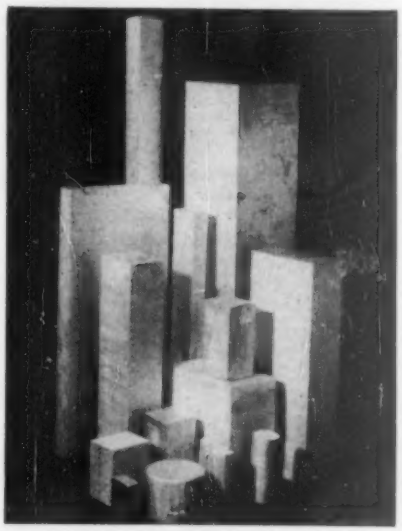
* * *

Bomarc, it has been pointed out, stands for a missile system named after Boeing (Bo-) and Michigan Aeronautical Research Center (-marc). Marc now is the Willow Run Research Center of the University of Michigan (Wrrcum), but as anyone will tell you, Bomarc is lots easier to say than Bowrrcum.

Marc, by the way, was one of the first systems investigators, and did early work on Project Wizard, an anti-aircraft missile. Positive contributions from Wizard, linked to the pioneering work done by Boeing on GAPA (which was set back by a couple of years in a jurisdictional dispute between services), have been combined in Bomarc. Progress, says everybody familiar with the project, has been satisfactory.

* * *

This delightful abstract composition is a grouping of aluminum hand forgings from Kaiser Aluminum & Chemical Corp. The picture typifies industrial



art at its imaginative best. For making a silk purse out of a sow's ear, the Graphic Arts Dept. of Kaiser gets the Maximum Lift Coefficient of the Week.

* * *

Unmanned earth satellites seem nearer, says Prof. P. E. Sandorff, who runs a seminar course on the subject at MIT. Sandorff told the American Rocket Society the value of scientific data to be obtained is such as to assure vehicles will be built. And the cost? Comparable to that of our supersonic aircraft research program. Manned vehicles are farther off, he says.—DAA

QUALITY SUBASSEMBLIES FAST...

See Whirlpool for Economical, Precision Airframe Production

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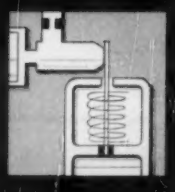

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LETTERS

Aviation Week welcomes the opinions of its readers on the issues raised in the magazine's editorial columns. Address letters to the Editor, Aviation Week, 330 W. 42 St., New York 36, N. Y. Try to keep letters under 500 words and give a genuine identification. We will not print anonymous letters, but names of writers will be withheld on request.

Airminded Youth

Parnell Schoenky, of McDonnell Aircraft, struck a vital point in his letter featured on your letters' page May 16 ("Model Beginnings").

Young men designing and building model airplanes, competing in air meets that require skill and ingenuity, are a valuable asset to the nation's aeronautical industry.

While Roy Marquardt is a brilliant example, there are hundreds. The modelling competition develops a certain "never-say-die" attitude that is exclusive and not acquired in any other way.

At the moment, the National Championship Model Airplane Meet is being organized for Los Alamitos NAS, Calif., by Academy of Model Aeronautics, a national organization made up of the eagerest, most enthusiastic model makers. To finance prize awards the Academy had to beg $100 donations from small manufacturers of parts and supplies required by modellers.

This has been going on for years. It's ironic that alert aviation firms like Boeing, Grumman, North American, Douglas, Northrop, McDonnell, Convair, Republic, Bell, United, Chance Vought, and others, have ignored the great possibilities for encouraging aeronautical talent by sponsoring the Nationals.

Or if they're not interested in developing talent in their fields, perhaps they should feel some moral obligation to perform a worthwhile public service. Setting up the Nationals as the target for America's airminded youths just to give them a recreation and keep them busy, would be practical reasoning. Especially since so much of the aircraft industry's revenue comes from the pockets of the average American citizen.

The model airplane activity is now the nation's No. 1 hobby.

CHARLES TRACY
Aviation Editor
The Cleveland Press
Cleveland, Ohio

Airplanes & Alcohol

Page 127 of your June 6 issue is devoted to a report on what two West Coast airlines are doing to attract extra business. These particular airlines have decided that booze is the big magnet.

It may come as a shock to these airlines, and others throughout the country that there is a large group of air travelers who resent being locked up in a small cabin with a group of people whose glasses are kept full from the time the plane is airborne until touchdown. When there are unlimited quantities of free liquor there is always someone in the group who gets obnoxious.

You report that: "UAL would prefer not to serve any alcoholic beverages" and that "President William Patterson is against mixing airplanes and alcohol." So they serve it. The green stuff is more important than principle.

From an operational standpoint there are three points to consider when serving liquor: 1) safety, 2) inconvenience and 3) cost.

In air travel safety is the number one consideration so let's forget points one and two. Are we going to have to wait until some tanked-up character decides that he is going to show the pilot how to land the plane at a crucial time in an instrument approach before someone decides that airplanes and liquor don't mix? Getting through the "locked" cabin door to the flight cabin is no problem if a person is determined to do it.

Ever seen a stewardess try to get someone to put their safety belt on after they've had a "few too many"?

Then there's the wise guy who decides it would be a big laugh to pull the handle on the emergency door at twenty thousand feet.

These are some of the more obvious things that can or do happen. The total list of all possibilities would be a long one.

Another UAL official explains that: "We don't want our stewardesses to become bartenders." What the hell else are they if they have to keep 93% of their passengers' glasses filled at all times?

It might be timely to suggest that the stewardesses wear tight sweaters, black slacks, high heels and white bobby socks to keep in style with their new jobs. They'll also be better able to do battle when some of their more amorous passengers start pawing and manhandling them in search of a little high altitude diversion.

It seems ironical that on the one hand the airlines are trying to build their family business with special low rates on certain days and on the other hand they are emphasizing the things that do not appeal to women and children. A man will think twice before he loads his wife and children into a flying tavern filled with cigar smoke and "happy carefree travelers."

It has always amazed me how many men don't travel by air because their wives don't want them to. Will guaranteeing a wife that her husband will be drunk before he reaches his destination help this public relations problem?

People travel by air because they want to get somewhere as quickly and comfortably as possible. They aren't interested in how much free liquor they will get. I seriously doubt that there are many people who would feel that life has passed them by if they didn't have a glass of fire water in their hand all the way from Chicago to New York.

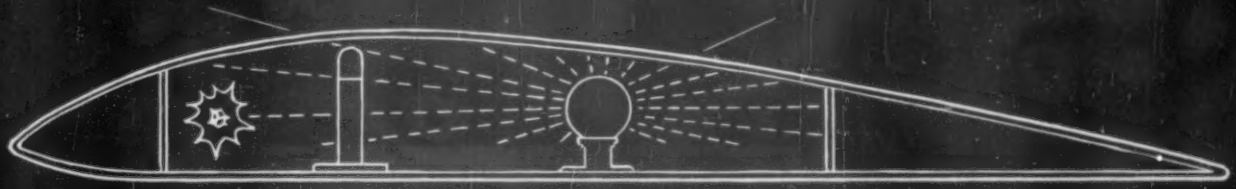
I suppose that the airlines that serve liquor have rationalized their decision to the point where they feel that no trouble will result from their action and that it increases business. If a law were passed tonight that the first airline to get into trouble because of liquor would lose their

We believe . . .

a most significant advance in military aviation safety occurred May 25 when, after months of thorough tests under gunfire, the world's first *practical* explosion extinguishing system — the Fireye *visual* system* — was delivered for installation on advanced type military aircraft.

1. Incendiary enters fuel cell. First spark is seen by Fireye Visual Detector.

2. Fireye Detector counter-explodes frangible container of extinguishing fluid.



This remarkable Fireye development in the hitherto uncontrolled field of explosions . . .

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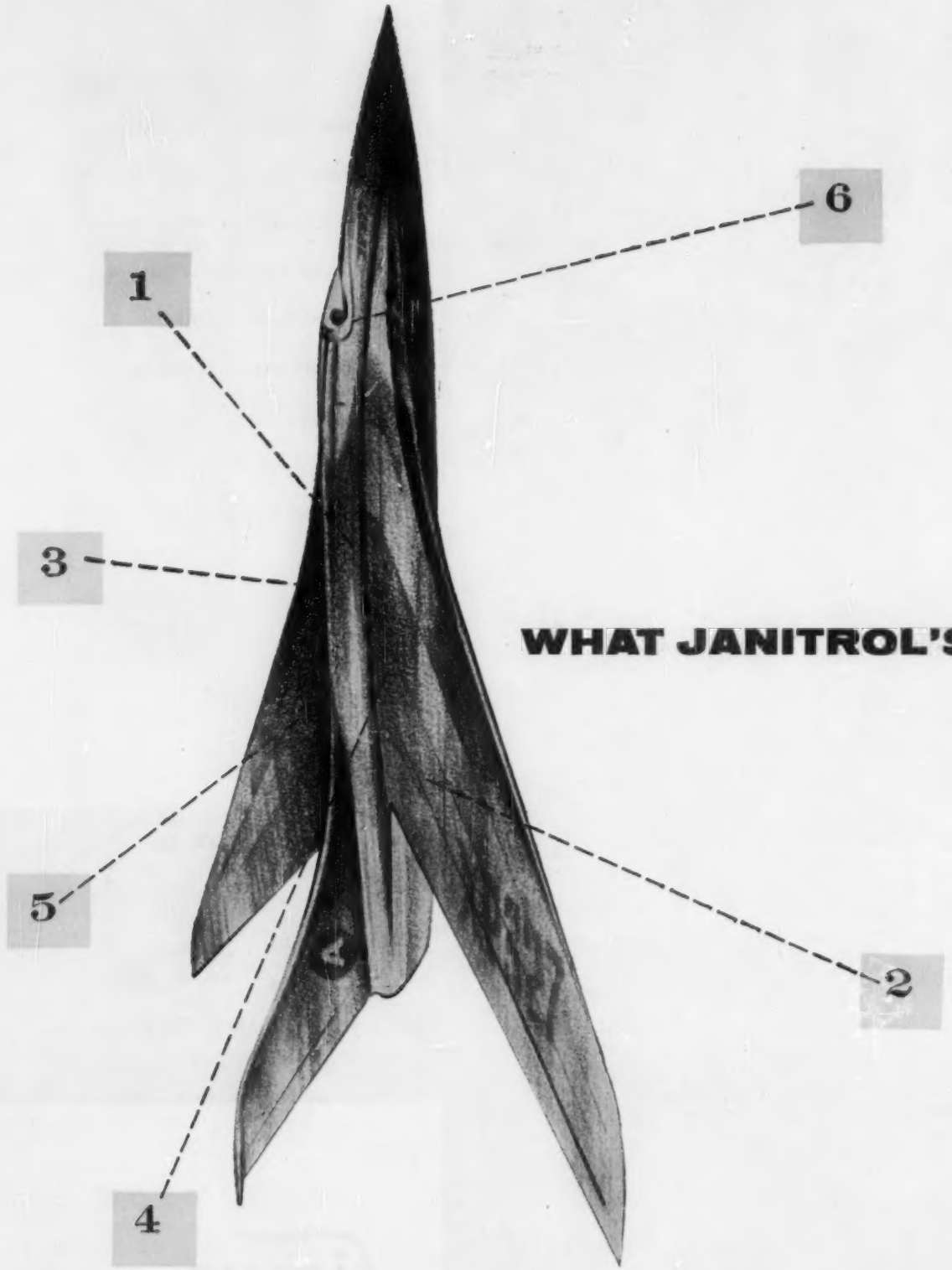
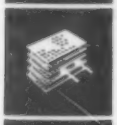


WHAT JANITROL'S

1 *gas turbine combustion systems*

2 *gas turbine accessories*

3  *heat exchangers*

4 *inert gas generators*

5 *deaerating oil tanks*

6 *high pressure regulators*

DOING IN JETS

If your projects involve increasing jet aircraft performance—to boost power without dry loss, to eliminate hot spots and thus achieve higher combustion rates, to develop new heat exchanger configurations—a call to Janitrol will give you a head start. Janitrol's specialized research and experience in combustion phenomena go back 50 years, and have resulted in such important developments as the Post-Turbine burner, automatic inert gas generators for inerting fuel cells, and the waffle plate principle of heat exchanger construction which improves heat transfer efficiencies and saves weight by getting the most out of metals.

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franchise, how many airlines do you think would be serving liquor tomorrow? Doubt if many would feel that liquor is so safe that they would risk the future of their business on it.

Fortunately, there are still a few airlines who have enough courage to stand by their beliefs and refuse to serve liquor. I haven't noticed that they have lost any passengers for being honest with themselves and doing what they believe is right.

Hope a solution to this problem is found before a planeload of people is splashed all over the country side.

D. B. SCULLY
1535 Sheridan Road
Highland Park, Ill.

50 Years of Avro

Over the past few years I have been slowly, if somewhat haphazardly, collecting information on Avro Aircraft.

I am endeavoring to complete not only the technical details of the various aircraft that this long established company has made, but wherever possible the histories of the individual machines. I should therefore appreciate it if any of your readers having the slightest information on Avro aircraft would be good enough to pass it to me.

It is my hope that in due course, preferably at a time applicable for Fifty Years of Avro Aircraft, to publish these records, and I should be pleased to give a copy of this publication to any of your readers who are kind enough to pass me information and/or photographs.

I would stress that even entries from pilots' log-books, particularly where the aircraft was either engaged in an interesting activity or has suffered in any way, or similar small items of interest, would be of great use to me.

C. E. STEINER
35, Rosslyn Hill
London, N.W. 3
England

Spaceship Propulsion

In your Apr. 25th issue, Space Mouse by Navy's S. F. Singer and Solar Drive Spaceship [proposed by Dr. Ernst Stuhlinger] both assume a condenser disposing of heat to nothing about as fast as reflectors absorb it from the sun.

Since there is no air to carry off the heat it must all be disposed of by radiation. Since the disposal of heat by radiation is proportional to the fourth or fifth power of the condenser temperature it would seem that the condenser would have to be hotter than the solar absorber and that if the steam turbine would operate at all its efficiency would be intolerable.

Can these gentlemen elaborate on their condensers?

D. K. WARNER
1937 Panama Drive
Sarasota, Fla.

(AVIATION WEEK asked Dr. Ernst Stuhlinger to comment on Mr. Warner's questions. His reply follows.)

The amount of heat reflected by each mirror into the boiler cavity is equal to the product of solar constant (1.3 kw. per square meter at a distance of 150 million km. from the sun), mirror area, and mirror reflectivity.

The temperature to which the boiler heats up under a given influx of heat energy is determined by the amount and the nature of the working fluid which is pumped through the boiler per second. About 10% of the heat energy reflected into the boiler is transformed into electrical energy in the turbogenerator, the residual 90% must be dissipated by the condenser.

The condenser temperature is determined by the amount of heat energy to be radiated off per second, the useful area of the condenser, and the color of the condenser (which determines the emissivity of the condenser surface).

In the particular design which was described in AVIATION WEEK last April, the boiler temperature is 420C, the condenser temperature 280C, the theoretical efficiency 20%, the real efficiency about 10%, and the useful condenser area about one-half of the useful mirror area. Increase of the condenser area would decrease the condenser temperature and hence increase the efficiency, but it would increase the condenser weight.

The above figures are chosen so that they yield a minimum of the total weight of the ship.

ERNST STUHLINGER
Route 4
Box 137
Huntsville, Ala.

Curious?
MOODBEAMS #7
Being curious about a fizzing firecracker is comparable, say, to NOT being curious about the condition of metal fuel tanks in an airplane. On the one hand, Hope Frarer (24, 5' 5", 118 lbs., blue eyes, blonde hair) may get the lipstick blasted right off that pretty, perky face of hers.
On the other hand, a pilot with a leaky gas tank may — well-llllll, you know!
If you aren't sure about your tanks, we urge you to get curious NOW, and let us remove, clean, inspect, and repair them; slush them with a protective compound, and reinstall them in apple-pie order. In any event, this should be done every thousand hours or two years.
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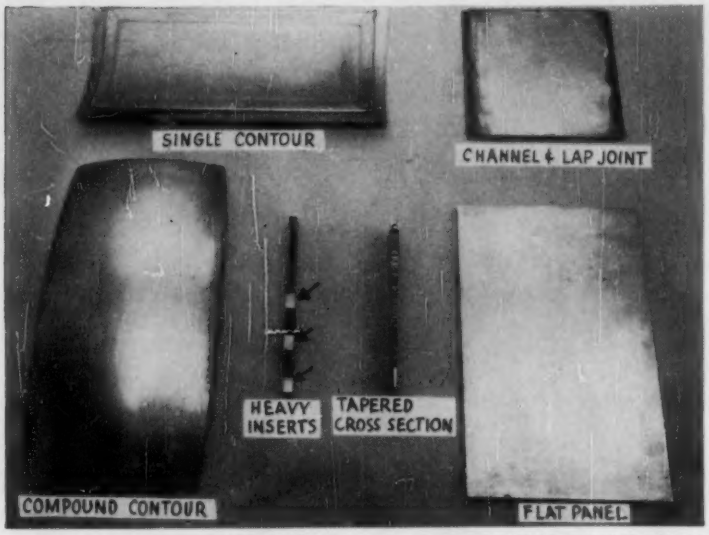


TYPICAL 17-7PH STAINLESS STEEL honeycomb panels fabricated by Rohr include double-contour panel development shown at right.

Rohr Develops Stainless Steel Honeycomb Structure Knowhow

By Irving Stone

Chula Vista, Calif.—An intensive development program on all-metal honeycomb stainless steel structures is being pushed by Rohr Aircraft Corp.

Though far removed from Rohr's established activities in power packages and airframe and component subcontracting, this work is considered necessary by the company's engineering planners to anticipate design thinking of prime contractors and be ready for the exacting demands of production work the designs will entail.

Rohr wants to build up a big store of knowhow for the day when all-metal honeycomb structures will be approaching routine use.

There is a trend toward all-metal honeycomb structure in many new designs of aircraft and missiles. Among the reasons:

- **It would provide high strength-weight material** that retains its properties in face of aerodynamic heating and propulsive blast of future military vehicles.
- **It would offer rigidity** required to meet the fatigue conditions that would normally be encountered with thin conventional skins subjected to supersonic flight.

Industry engineers feel that the all-metal honeycomb structure may be the next progression after conventional titanium alloy makeup meets temperature and design limitations. The honeycomb makeup may be all stainless, may even embody titanium alloy in part.

Aim of Rohr's program is to develop:

- **Manufacturing techniques** leading to a production status.
- **Engineering allowables** to permit airframe builders to utilize all-metal honeycomb structure efficiently in their designs. Rohr engineers believe that the processor of these structures will have to supply design criteria to the prime contractor. This is because detail design will have to be tied to manufacturing techniques pretty much on a specific piece-to-piece basis. Rohr's present developments in all-metal honeycomb makeup are counterparts of actual components established by airframe manufacturers for designs either in production or in preliminary design stages.

Some of these items:

- **Wing and control surfaces** in region of jet blast.
- **Blast panels.**
- **Jet pod cowling,** strut skins and fairings.
- **Jet engine shrouds,** serving as heat barriers, in buried installations.
- **Aerodynamic surfaces** of missiles. Future high-Mach-number aircraft may also use the material to counteract effects of aerodynamic heating.

One of the prime considerations with all-metal honeycomb structures is the basic method for combining (attaching) the core, skin and edge components.

Preliminary investigation at Rohr has shown that a number of methods are feasible, including:

- **Furnace brazing.**
- **Induction brazing.**
- **Resistance welding.**

Furnace brazing, Rohr engineers believe, offers the most immediately feasible approach for perfecting these structures to meet present-day projections of airframe builders.

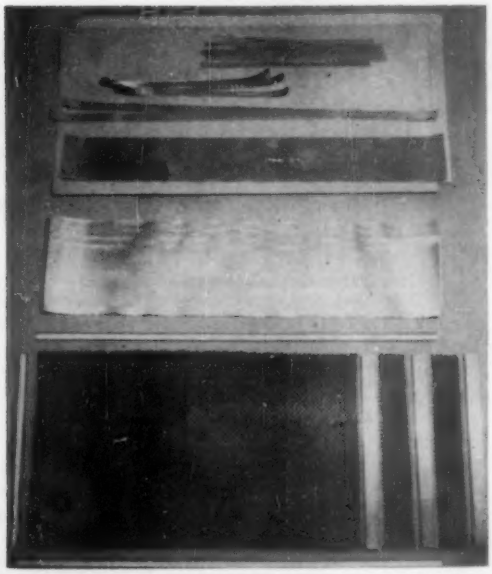
This doesn't mean that induction brazing or resistance welding is ruled out in Rohr's development thinking.

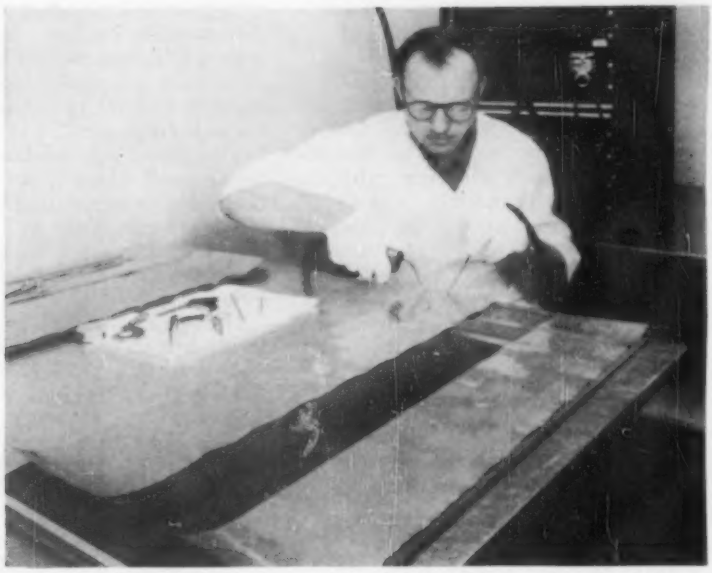
At this point in the development program, Rohr is furnace brazing, using dry hydrogen atmosphere, no flux, and

What Rohr Builds

World's largest producer of ready-to-install power packages for aircraft, Rohr also has demonstrated wide versatility in other fields. Some of the items the company manufactures include:

- **For Boeing: Jet pods, wing tanks, aft fuselage sections, and flap tracks for the B-52; jet pods, horizontal stabilizer and elevator assemblies for the KC-135 jet tanker; and power packages for the KC-97 piston-powered tanker.**
- **For Convair: Guided missile components; B-36 exhaust system components; power packages and augmentors for the 340 airliner, T-29 trainer and C-131.**
- **For Douglas: Pneumatic system assemblies for RB-66; power packages for the DC-7.**
- **For Lockheed: Turboprop power packages for the C-130; power packages for the P2V and Super Constellation.**
- **For Fairchild: Fuel tank cradle assemblies; power packages for C-123.**
- **For Curtiss-Wright: Variable-area jet nozzles.**





COMPONENT PARTS of flat all-metal panel with heavy bar inserts (left-hand picture, lower right) to take concentrated loads. Strips are braze ribbons. Operator in right-hand photo is tacking ribbon in place during layup of typical flat panel with heavy inserts.

brazing alloys with melting temperatures in the range of 1,700-1,800F (to meet operating temperatures as high as 850F).

The no-flux condition is considered important.

Rohr engineers point out that a structure brazed with flux is subject to corrosion in the presence of moisture if all the flux has not been removed—and this complete removal isn't practical. Because this type of sandwich structure does not lend itself to use of a protective coating, and also because there is no opportunity for internal inspection, Rohr considered it best to eliminate the flux to rule out corrosion.

Research and development is going ahead on brazing alloys with melting temperatures on the order of 2,100F to boost the material's operational limit to perhaps as high as 1,200F.

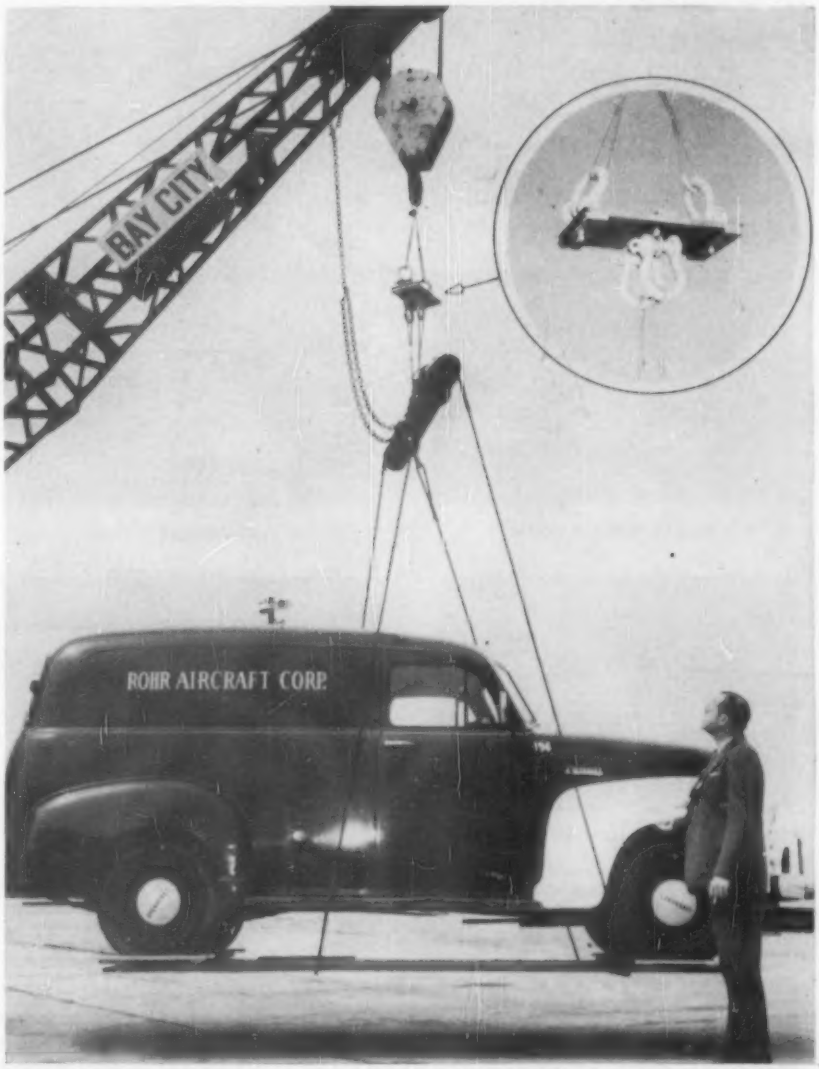
Tooling Design

The higher temperature brazing range brings increased problems of maintaining dimensional control on large panels and introduces additional difficulties in manufacturing techniques.

Thus, tooling, a controlling factor in the successful production of the all-metal honeycomb structure, must meet these requirements:

- **Maintain dimensional accuracy** under the firing (brazing) temperature conditions.
- **Be light** and built to permit application of closely controlled heat to the brazed unit.
- **Have a reasonable life,** in the face of the heat conditions, for production runs.

Through use of high-temperature tooling materials and a unique tooling design configuration, Rohr has met



HONEYCOMB PANEL supports panel truck in demonstration of strength and rigidity.

these prime tooling requirements in a practical manner.

Non-Destructive Tests

Development of non-destructive testing techniques for production articles is another prime requisite in the all-metal honeycomb structure program, the company points out.

Rohr is using sonics in its approach to the problem. It has devised a resonance vibration arrangement consisting of audio amplifiers and a probe. As an indicator, Rohr uses either an oscilloscope or meter, but prefers the meter since the oscilloscope is a laboratory instrument.

The probe is run along the surface of the sandwich structure. A void spot or reduction in the amount of braze material gives a higher indication on the meter as a result of change in natural frequency response.

This device now has been developed to the point where it promises a practical non-destructive inspection check for various conditions of braze defects, not only in flat panels but in compound curvature configurations as well, Rohr technicians feel.

Next phase is mainly concerned with the calibration of the inspection system. This involves a program of correlating instrument readings with known defects in samples serving as "standard" check pieces.

Materials

Rohr's development work on the overall program now is centered around the use of 18-8 stabilized and unstabilized stainless steel facings and core for non-structural applications such as engine shrouds and fairings.

Where higher strength is required, such as in missile aerodynamic surfaces, and in engine cowling and strut skins, 17-7PH heat-treatable stainless steel facings and core are involved.

Combinations of 17-7PH core and 18-8 facings also have been utilized by Rohr engineers.

Facing thicknesses vary from .002 to .064 in combination with core material gage of .0015, with cell size varying from $\frac{1}{4}$ to $\frac{1}{2}$ in. square. These combinations have been included in the development program primarily because the designs Rohr has under consideration demand them. Other combinations of skin and core also could be used if desired.

The program has included all the basic configurations to which the honeycomb structure could be applied, such as flat panel of constant thickness, single and double contour panels of constant thickness, and tapered panels.

Present processing equipment at Rohr will accommodate curved panels of approximately 3x5 ft. with 3-ft. depth of maximum curvature, on a development basis. Equipment now being installed will boost this size to about 5 x 12 ft. x 5 ft. deep.

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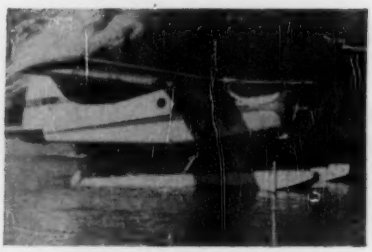

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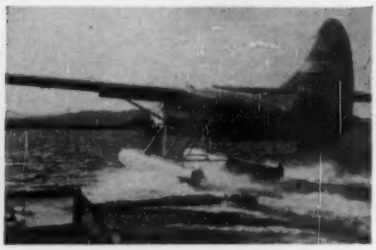

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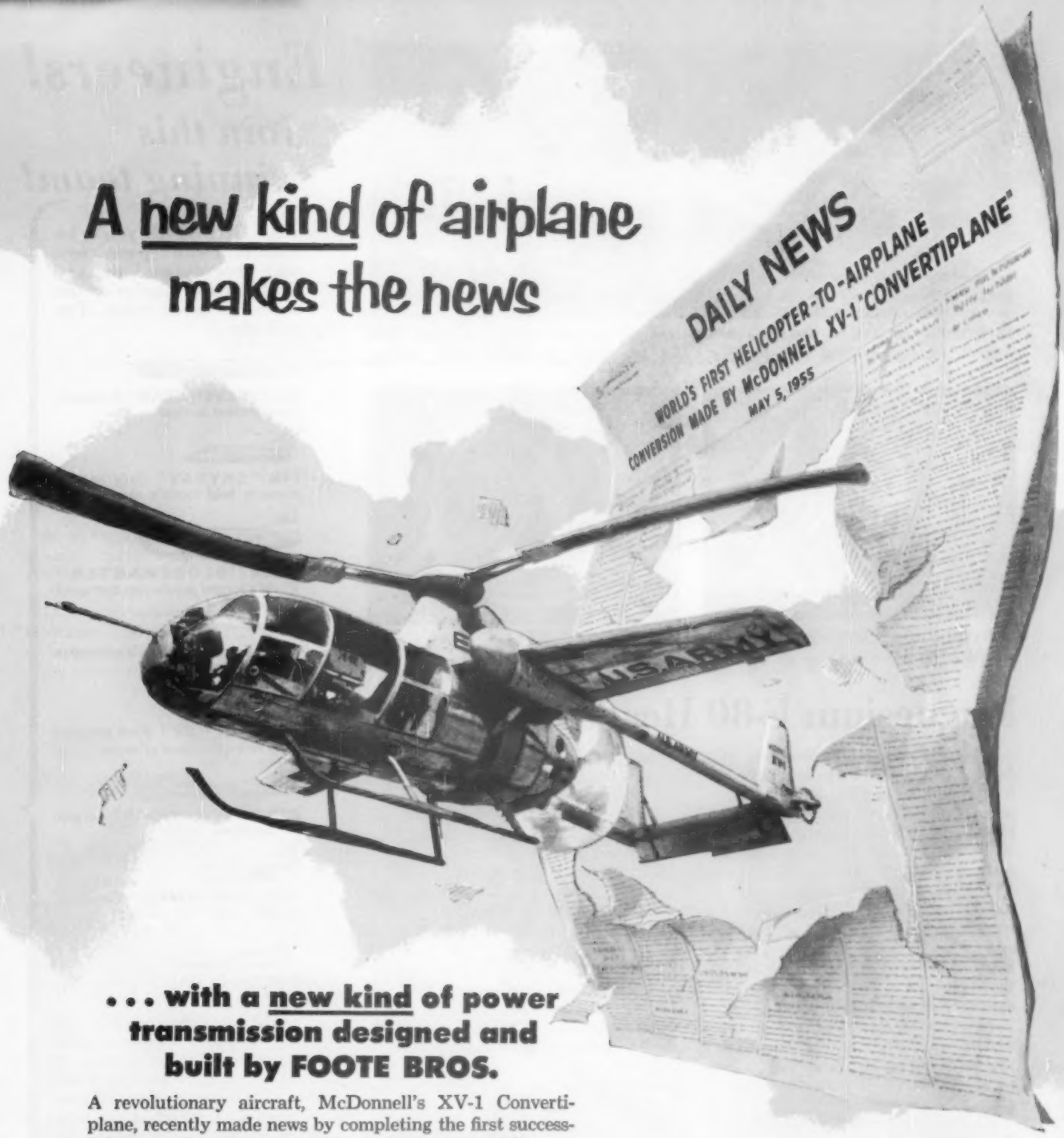
▶ **Modular semi-continuous 1,000-lb.** vacuum melting furnace installed in Carboloy Dept. of General Electric Co., Detroit, adds better than 120,000 lb. monthly of specialized vacuum melted alloys to U. S. capacity. Unit was supplied by Consolidated Vacuum Corp., Rochester, N. Y. Similar equipment was recently installed by Westinghouse Electric Co. (AW Apr. 4, p. 62).

▶ **Stillman Rubber Co.,** Los Angeles, Calif., has qualified as an approved source for AN 6290 O-ring gaskets for USAF aircraft hydraulic and pneumatic systems. Firm's compound SR 810B-90 has met qualification trials at Wright Air Development Center.

▶ **Gibson Refrigerator Co.'s** Special Products Division, Greenville, Mich., has delivered its 10,000th J65 jet engine component, a combustion chamber assembly. Firm makes parts for Curtiss-Wright and Ford's Aircraft Engine Division.

A new kind of airplane makes the news



. . . with a new kind of power transmission designed and built by FOOTE BROS.

A revolutionary aircraft, McDonnell's XV-1 Convertiplane, recently made news by completing the first successful conversion from vertical to horizontal flight . . . a *totally new concept of flight* which combines the vertical flight characteristics of a helicopter with the speed and range of a conventional fixed wing aircraft.

To help put this remarkable aircraft in the air required a completely *new kind of power transmission* for the pusher propeller and the rotor which is driven by pressure jets located at the tip of each of the three blades. McDonnell called on Foote Bros. to design and build this highly intricate transmission. The successful flight of the XV-1 is ample testimony to the skill and capacity of Foote Bros. to meet the exacting needs of America's great aircraft manufacturers. It will pay *you* to see Foote Bros. first—the right place to bring your power transmission and mechanical actuator problems!

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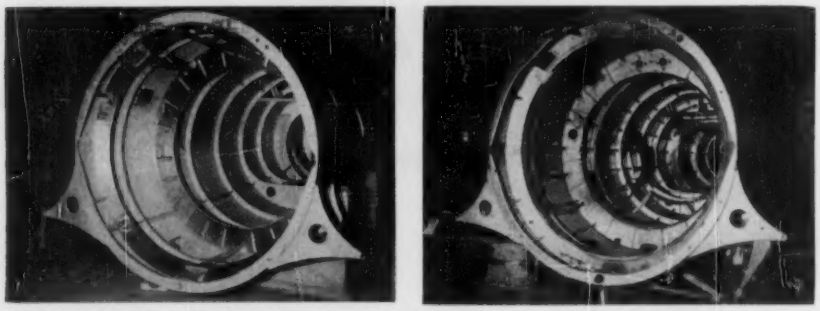
EXPERIMENTAL ALL-MAGNESIUM F-80C taxis out for first flight at Mitchel AFB. Aircraft was designed and built by East Coast Aeronautics for evaluation by ARDC.



CONSTRUCTION SIMPLIFICATION made possible by use of magnesium is shown in comparison of these two rear fuselage sections; magnesium is at left, aluminum at right.

Magnesium F-80 Heads for WADC

All-magnesium F-80C Shooting Star, built for Air Force to determine the feasibility of using the light metal for primary aircraft structure, recently completed its maiden flight at Mitchel AFB, N. Y., and now faces extensive tests at Wright Patterson AFB, Ohio.

The plane was designed and manufactured by East Coast Aeronautics, Pelham Manor, N. Y., for the Air Research and Development Command (AW Sept. 28, 1953, p. 28). It took three years from initial design to rollout, including one year for fabrication.

Approximately 3,000 lb. of magnesium sheet and extrusions went into the F-80C. The plane's weight is comparable to that of a standard aluminum alloy F-80.

The aircraft's structure is more rigid than that of its aluminum counterpart. This is because skin gage is considerably heavier in the plane made of the lighter metal. Where Lockheed uses 0.51 skin with multiple stiffeners, ECA uses ⅜-in. magnesium members with no stiffeners. Result: an approximate 30% reduction in fasteners. This means a less expensive, faster-built aircraft with smoother external surface.

Although magnesium costs about 10% more than aluminum, the finished magnesium plane costs about 25% less than a conventional ship—raw material accounts for only about 5% of a plane's cost, says ECA, and the labor savings more than offset magnesium's higher price.

The company estimates its F-80 will be 8-10 mph. faster than a standard ship, because of its smoother skin. Officials say that magnesium wings installed on a conventional F-80 increased the plane's speed 5 mph.

Magnesium is more susceptible to fatigue than aluminum, but J. P. D. Garges, ECA's vice president-engineering, believes the experimental plane will be less prone to this type of failure than aluminum F-80s, because of its thicker skinning and rigidity.

Thermal resistance of magnesium is currently about the same as aluminum. Strength loss starts at about 275F, but a new magnesium-thorium alloy, already available in many gages, raises this to about 500F, according to Garges.

Air Force Secretary Harold Talbott flew to Mitchel to inspect the all-magnesium fighter and see it fly. First demonstration flight for the press was delayed 24 hours by three successive malfunctions.

First the right wing tip tank release solenoid became inoperative. Then a highspeed taxi run showed up a spongy right brake. When this had been corrected, a welded relay put the plane's electrical system out of commission, canceling the flight for the day.

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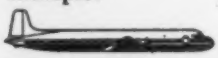

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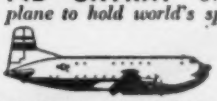

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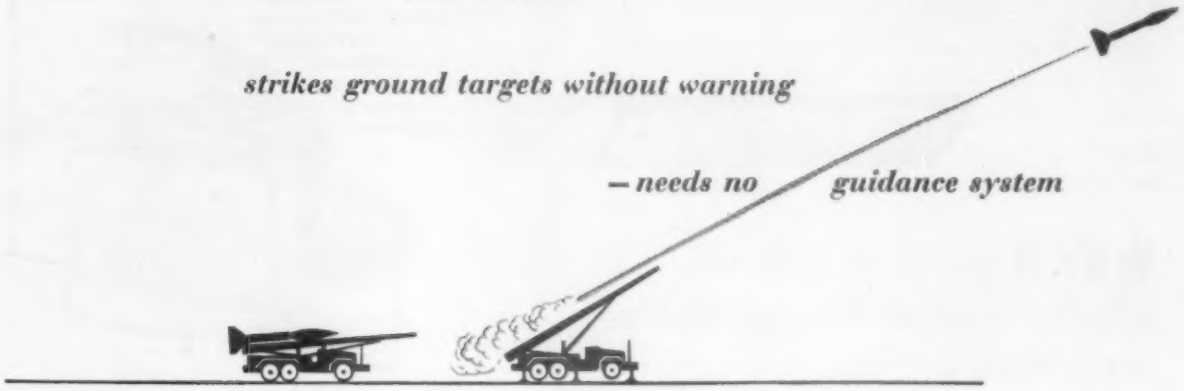

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Add to the U. S. Army's ever-growing arsenal of rocket weapons a new ground-to-ground missile . . . the Douglas-designed Honest John.

Developed in co-operation with Army Ordnance—and already being delivered to troop units—Honest John is a free flight rocket without complicated guidance system, and designed to supplement artillery in the medium to heavy range. Honest John is extremely mobile, moves quickly into position on a special truck which also serves as transport *and* launcher. Highly accurate, this rocket can handle either an atomic warhead, or a single high explosive round equalling the explosive force of hundreds of rounds of artillery shells.

Design of Honest John and other missiles is further evidence of Douglas leadership in its field. Now that the time to produce missiles in quantity is come, Douglas manufacturing skill is ready and able for the job.

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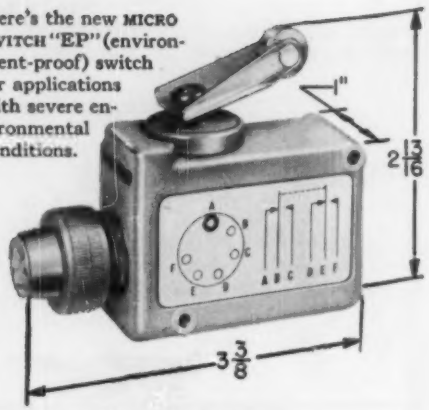
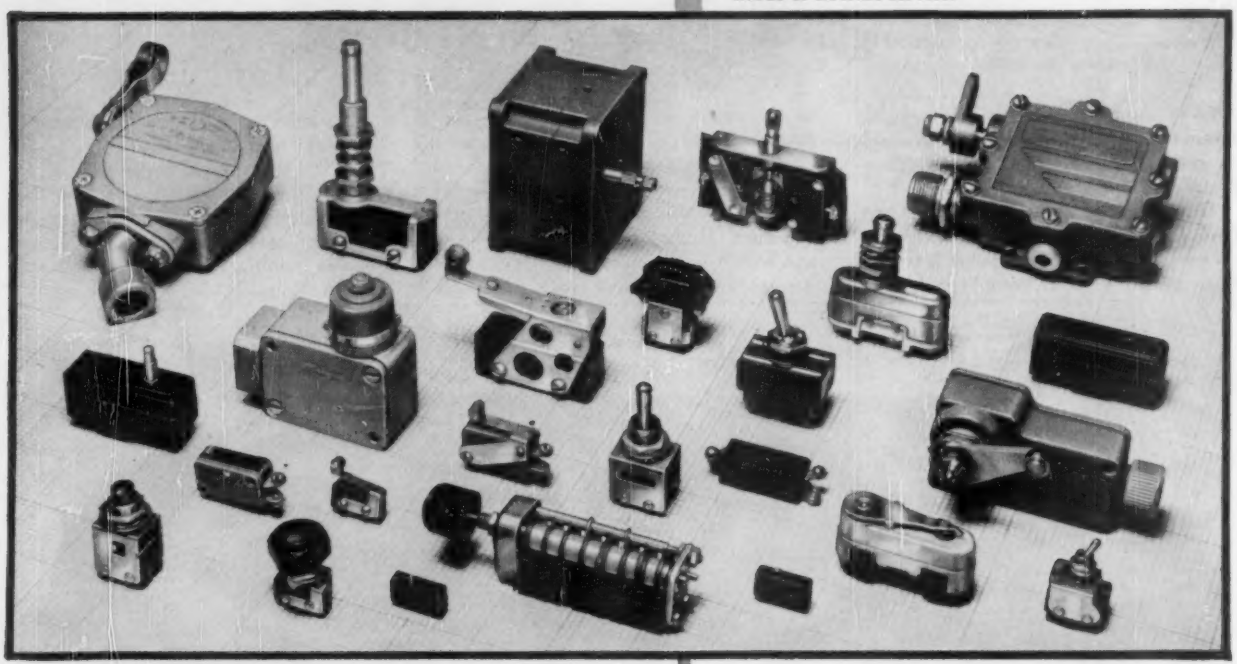


Here's the new MICRO SWITCH "EP" (environment-proof) switch for applications with severe environmental conditions.

A few of the wide variety of MICRO SWITCH types developed to meet the exacting specifications and rigorous needs of aircraft service.



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AVIATION CALENDAR

July 11-22—Special summer program on Aerodynamics of Unsteady Flow, Massachusetts Institute of Technology, Cambridge.

July 12-14—Western Plant Maintenance and Engineering Show, produced by Clapp and Poliak, Pan Pacific Auditorium, Los Angeles.

July 16-24—Philadelphia Glider Council, annual open house, Philadelphia Gliderport, Hilltown, Pa.

July 27-29—Rotterdam Helicopter Congress, Rotterdam, The Netherlands.

Aug. 5-7—Experimental Aircraft Assn., third annual Fly-In and Convention, Curtiss-Wright Airport, Milwaukee.

Aug. 8-10—Institute of the Aeronautical Sciences, second National Turbine Powered Air Transportation Meeting, Olympic Hotel, Seattle.

Aug. 10-14—Air Force Assn., Convention and Airpower Panorama, San Francisco.

Aug. 15-17—Society of Automotive Engineers, West Coast Golden Anniversary Meeting, Hotel Multnomah, Portland, Ore.

Aug. 22-23—Symposium on Electronics in Automatic Production, sponsored by Stanford Research Institute and the National Industrial Conference Board, Sheraton-Palace Hotel, San Francisco.

Aug. 24-25—Western Electronic Show and Convention (WESCON), Civic Auditorium and Fairmont Hotel, San Francisco.

Aug. 24-26—International Ignition Conference, conducted by Scintilla Division of Bendix Aviation Corp., Sidney, N. Y.

Sept. 3-5—Twenty-ninth National Aircraft Show, Philadelphia International Airport.

Sept. 3-9—Aircraft Owners & Pilots Assn., eighth annual Roundup Flight Cruise, New York to Bermuda.

Sept. 12-16—Instrument Society of America, 10th annual Conference and Exhibit, Shrine Exposition Hall and Auditorium, Los Angeles.

Sept. 17—Institute of Radio Engineers, Symposium on Automation, Cedar Rapids, Iowa.

Sept. 28-29—American Institute of Electrical Engineers and Institute of Radio Engineers, 1955, Industrial Electronics Conference, Park Sheraton Hotel, Detroit.

Oct. 3-5—Eleventh annual National Electronics Conference, Hotel Sherman, Chicago.

Oct. 4-6—Eleventh annual Aircraft Spark Plug and Ignition Conference, sponsored by Champion Spark Plug Co., Secor Hotel, Toledo, Ohio.

Oct. 5-7—National Business Aircraft Assn. eighth annual Meeting and Forum, Sheraton-Cadillac Hotel, Detroit, Mich.

Oct. 5-7—1955 National Airports Conference, sponsored by American Association of Airport Executives and University of Oklahoma, Norman, Okla.

Oct. 11-15—Golden Anniversary Aeronautic Meeting, Aircraft Production Forum and Aircraft Engineering Display, Hotel Statler, Los Angeles, Calif.

Oct. 17-21—International Air Transport Assn., 11th annual General Meeting, Waldorf-Astoria Hotel, New York, N. Y.

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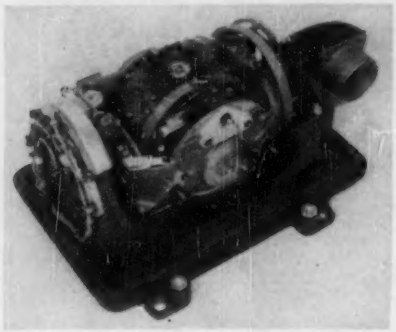


Non-Caging Gyro Weighs 4.5 Lb.

Two-axis non-caging vertical gyroscope weighs 4.5 lb., can take up to 10G vibration at 55 cps. and has an accuracy of 0.15 deg. of true vertical in each axis, the manufacturer reports. Drift rate is said to be less than 0.5 deg./min. and angular momentum is 4.75 x 10^6 gm.-cm.^{2}/sec.

The unit features a 2 to 6 deg./min. factory-set erection rate and requires only 1 min. to reach a usable speed. Pitch freedom is ±85 deg. and roll freedom is ±165 deg.

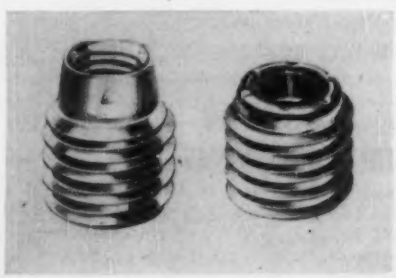
Aeronautical Division, Minneapolis-Honeywell Regulator Co., 2600 Ridgway Rd., Minneapolis 13, Minn.

Lock Bushing for Soft Metals

New self-locking, vibration-proof bushing is designed for use with relatively soft materials such as aluminum, magnesium, mild steel and some plastics.

The bushing, which provides a self-locking blind fastening, is available in two forms: type N2424, with red nylon locking device, is good up to 250F; type LH2424, all-metal locking device, is good up to 550F.

Replacement bushings do not have to be over-size because socket threads can be reworked with a sizing tool to accept a new bushing of the same size, the maker says. Also, because of the external method of locking provided by the bushing design, less hoop stress is created in a casting, allowing smaller edge distances and a reduction in boss size.



Type 2424 bushings can be used in any material whose hardness is less than Rc 25 by tapping a hole with a Class 2, controlled root tap. Device is easily removed with a standard screw extractor tool. Bushings have been replaced as many as 10 times without appreciable loss of initial locking torque, it is claimed.

Units are available in these internal thread sizes: 10-32, ¼-28, 5/16-24 and ⅜-24.

Elastic Stop Nut Corp. of America, Union, N. J.

Blower Raises Pressure

Model 100 blower uses a 5-in.-diameter rotor to obtain high pressure rise through speeds to 38,000 rpm., with the rotor delivering a pressure rise of about 65-in. of water static head at sea level. Static efficiency is better than 75% from the hydraulic energy input to static pressure rise output, the manufacturer claims.

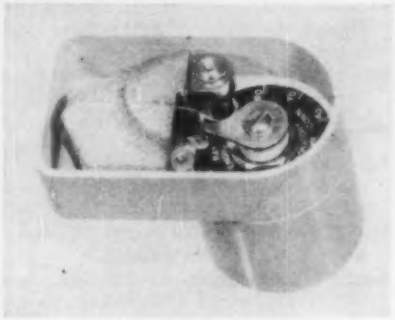
The unit supplies 22 lb. of air per minute at a static head rise of 20 in. at 20,000 ft. altitude pressure and 200F inlet temperature. Blower is 15 in. high and 8½ in. wide at the mounting flange. Weight is 15 lb.

Propulsion Research Corp., 1860 Franklin, Santa Monica, Calif.

Small Timer for Missile Use

Designed specifically for installation in missile or airborne equipment, small timer provides maximum time delays from 1 sec. to 6 min. in the various models.

Unit contains a spring-wound timer



and a single-pole double-throw switch. Three actuators are available: pull wire, dimple (explosive) motor or G-weight (illustrated).

Switch is rated at 5 amp., 250-v., non-conductive. Operation can be carried out at 40 G, −60F to 200F with a ±10% accuracy, it is stated by the manufacturer.

Raymond Engineering Laboratory, Middletown, Conn.

Potentiometers Weigh 0.5 Oz.

Subminiature precision potentiometers weighing 0.5 oz. and with ⅝-in. diameter are designed to combine the features of larger units. Units are planned for computers, trimmers, guided missiles, portable and aircraft equipment.

Series C-078 potentiometers have

multiple-finger contact brushes, gold connectors and 320-deg. electrical rotation. Units can be ganged and independently phased.

Electronic Sales Division, DeJur-Amsco Corp., 45-01 Northern Blvd., Long Island City 1, N. Y.

Tach Generators Work at 450F

New tachometer generators can operate at ambient temperatures of 450F, the maker reports. The units feature separable-type specially heat-treated ball bearings, stators having Teflon-insulated magnet wire, high-temperature materials in electric connectors, and grease having 525F to −90F temperature ranges. The grease permits breakaway at 1-in. lb. breakaway torque.

Designated H60-164, the generators are two-pole three-phase units meeting

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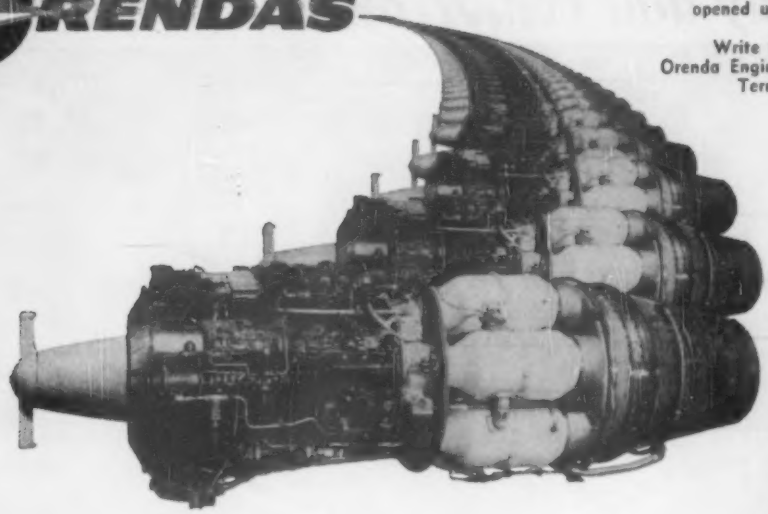

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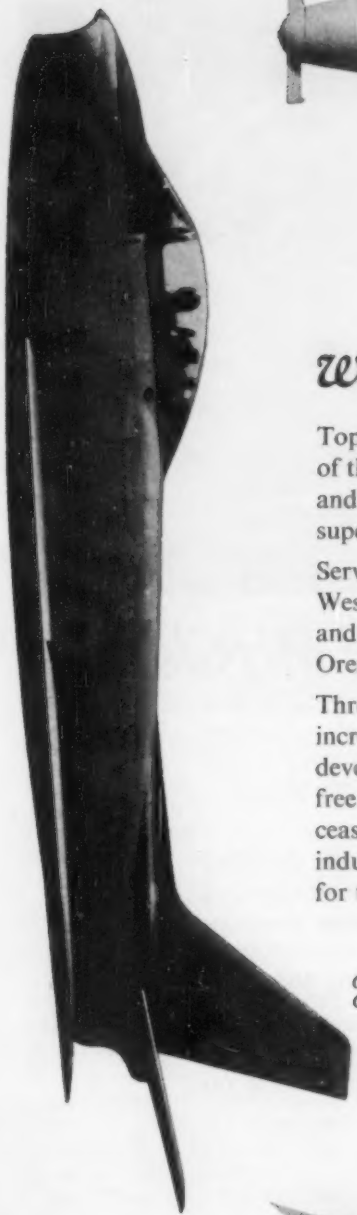

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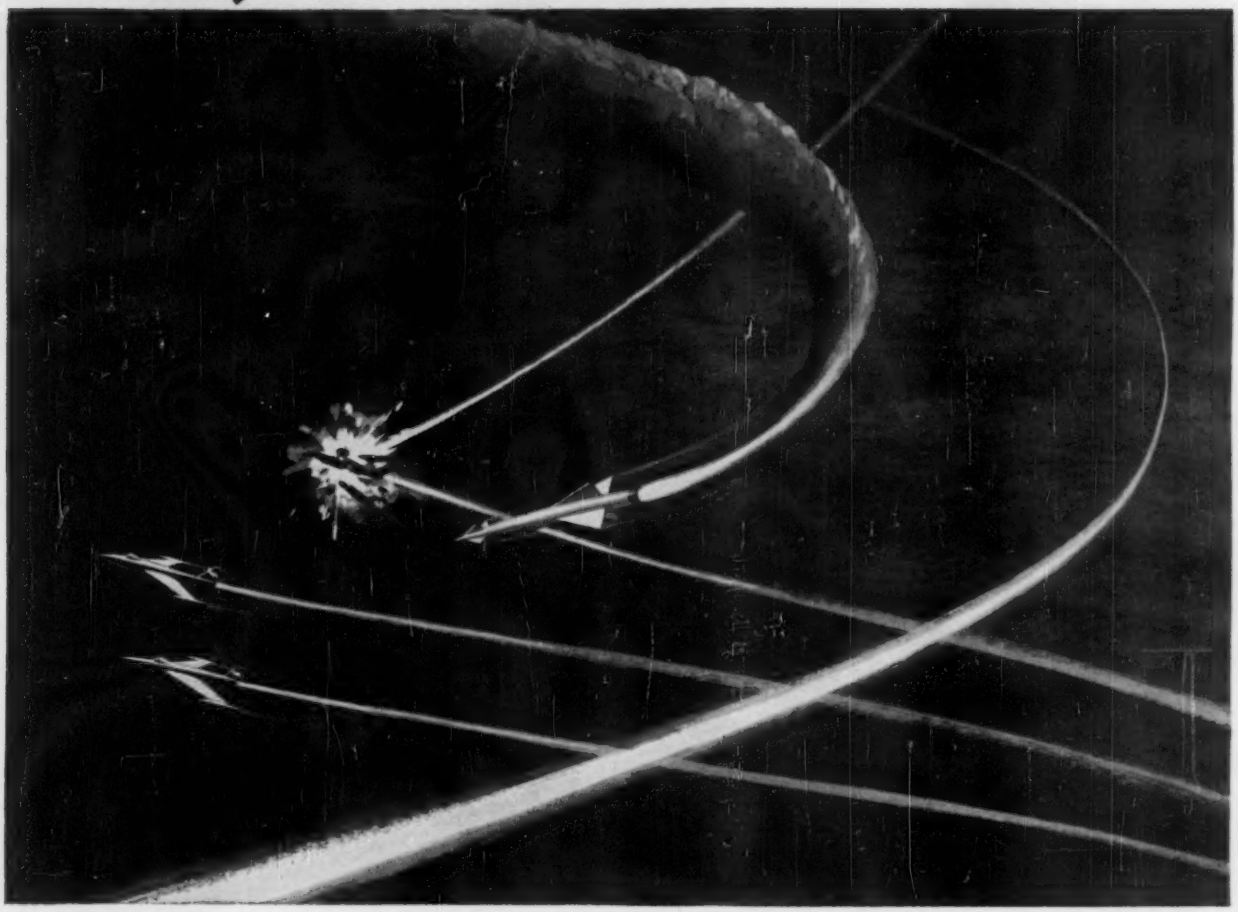

CANADAIR COUNTS — *in Guided Missiles*

Grim herald of the push-button war, the guided missile's development has become an urgent matter for all world powers. The missile itself is not enough . . . the race is now for sharper control, greater speed, higher altitudes, more sensitive response.

In the interests of national security, this program is naturally classified but we can say this much: we are working closely with Canadian government research agencies, in the advanced technological fields of design, development and construction of guided missiles. We have produced missile airframes and control equipment . . . have seen them through actual firing tests.

This is a challenging field, where Canadair engineers face and overcome new problems every day. In missile development, as in other fields of aeronautical achievement, people who know say, "you can count on Canadair."

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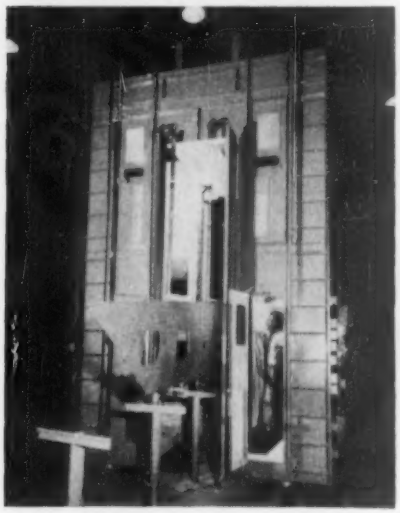
Jack & Heintz, Inc., 17600 Broadway, Cleveland J Ohio.



Paint Booth Travels 25 Fpm.

Traveling paint booth that moves 25 fpm. needs fewer than one-third the usual power units for hydraulic mechanisms, air inlet and exhaust. Also, only 12,000 cu. ft. of air per minute are expelled, compared with about 10 times that much used on a stationary booth, it is reported.

The unit has been put into operation at Boeing Airplane Co.'s Wichita plant, where it paints wing skins and spar chords for the B-47 and B-52.

Power units, air compressors and exhaust systems are self-contained in addition to 75-lb. CO_2 automatic fire protection bottles. Price of the booth: about $45,000 installed.

De Vilbiss Co., Toledo, Ohio.

Tape Recorders Gather Flight Data

Series 800 airborne magnetic tape recorders are lightweight, shock-resistant equipment that can handle from two channels of data on ¼-in. tape to 28 tracks on 2-in. tape. Plug-in amplifiers permit recording data in FM, AM or PWM (pulse width modulation) form, as desired.

The remote control unit that initiates and stops recording also measures quantity of unused tape and fits into the palm of a hand, it is reported. Power to operate is 400-cycle, 115-v., a.c. and 27.5-v. d.c.

An example of the unit's size: the five pieces of equipment required to tape five channels occupy 2.3 cu. ft. and weigh 88.5 lb.

Instrumentation Division, Ampex Corp., 934 Charter St., Redwood City, Calif.

Large Parts Degreased Fast

New series of electric, gas or steam-heated heavy-duty degreasers has a double sump; one contains the heater element which boils the solution, the other takes the contaminated solvent and has a removable pan. The pan can be removed and cleaned and replaced with minimum interruption in work.

Units come in four different sizes to handle loads of 4,000 lb. to 12,000 lb. per hour.

Phillips Manufacturing Co., 3415 W. Touhy Ave., Chicago 45, Ill.

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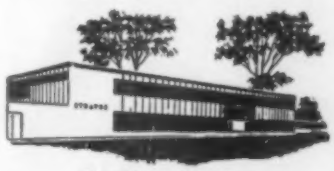

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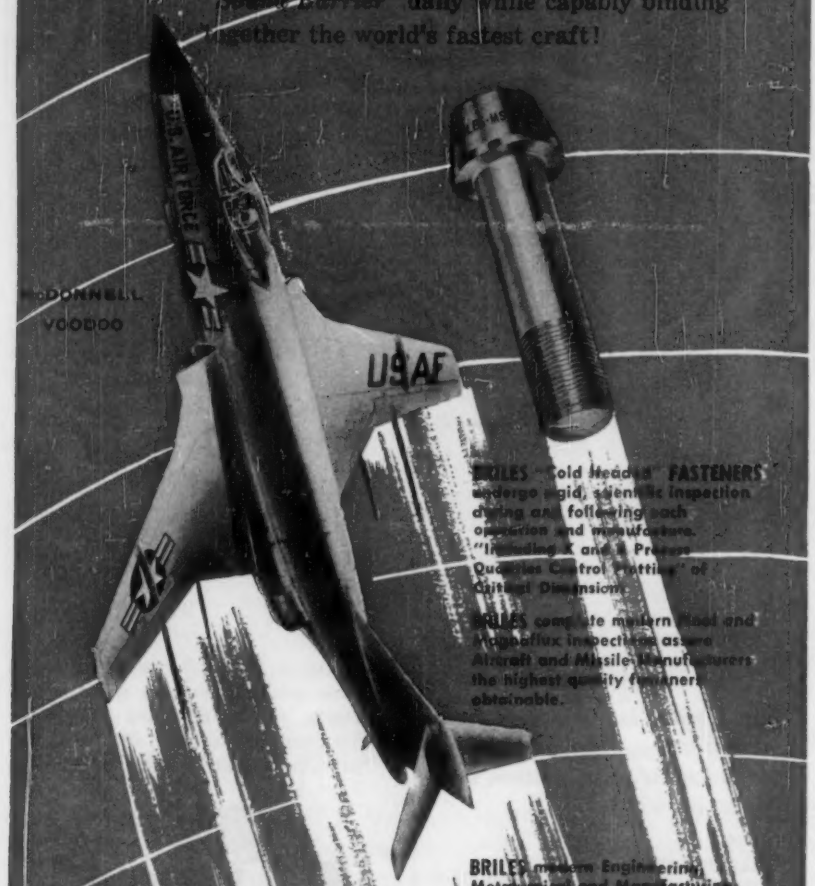

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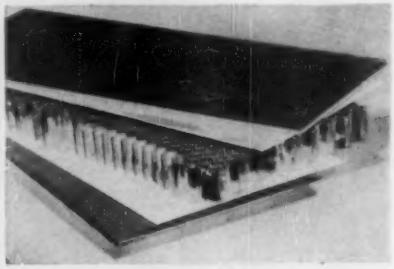

Glass-mat supported adhesive film allows metal-to-metal, plastics, or skin to honeycomb core bonding, reportedly has strengths to 40 lb./in. in peel and tensile shear of over 2,000 psi. Plymaster V-2 film can be cut with shears. Curing cycle is 300F for 10 min. with 50 psi. pressure.—Rubber & Asbestos Corp., Bloomfield, N. J.

Electronic level and flow control instrument comes in three versions: tube-in-probe Tektor, differential Tektor and time-delay Tektor. First unit has additional circuitry giving closer-tolerance control and allowing any length conductor cable; second version gives one-instrument level control where high and low-level differential is to be maintained; third model is applicable to situations where span between high and low levels is about 5 ft.—Fielden Instrument Division, Robertshaw-Fulton Controls Co., 2920 N. Fourth St., Philadelphia 33.

Tool grinders range from 6-in. to 14-in. wheels. All are double-end models with reversible motors.—Ex-Cell-O Corp., Detroit, Mich.

Unimatic borer can handle work up to 9 in. in diameter and bore to 6 in. It can be run by unskilled personnel.—Atlantic Instrument Corp., 90 Broadway, Norwood, Mass.

Lev-Elasto Damper, an adjustable leveling mount, eliminates need for anchor bolts and shims. Vibration-isolating element will not pack down and is unaffected by oils or chemicals.—Korfund Co., Inc., 48-03D 32d Place, Long Island City, N. Y.

DriQuik infrared interlocking oven sections allow construction of units of any desired shape or contour, the maker reports. Sections use lava-coated ceramic-type infrared long-life generators in place of bulbs.—Dry Clime Lamp Corp., Industrial Division, Greensburg, Ind.

Toolmaker microscopes from 1¼x2-in. range to 8x40-in. range permit measuring coordinates to 0.0001 in., angles to 1 min. of arc. Units can be used by anyone who can read a micrometer, the

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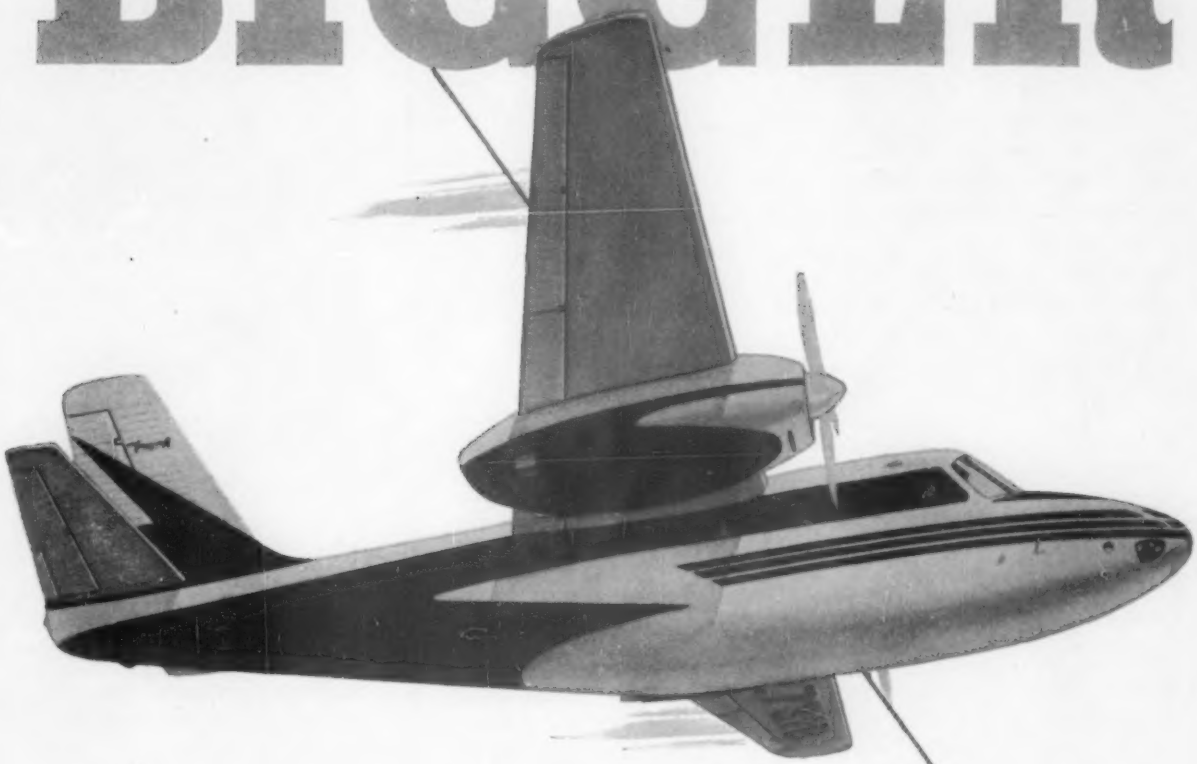

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(Advertisement)

Valve Talk

for WM. R. WHITTAKER CO., Ltd.

by Marvin Miles,
Senior Member, Aviation Writers Assn.

If you try to comply with every specification in producing a valve — or most any other complex aircraft component, for that matter — the odds are 100-to-1 you'll never deliver it.

A harsh statement, but true. Ask any supplier.

Better yet, have a look at military and customers' specs for most any standard unit such as a motor operated fuel shut-off valve, pages and pages of fine print, specs referencing specs that in turn reference other specs.

"Boiler plate" specifications, they're called.

Trouble is, the harried spec writer is usually so rushed that he must rely on previously approved specs for much of the technical information he uses. This re-hashing of older specs invariably results in longer and more unrealistic documents.

Another undesirable trend is reflected in the use of specification requirements which are superfluous. For example, take the case of a valve designed merely to assure balanced air pressure in an unoccupied nose radar compartment. Under "Smoke Contamination" the spec for the valve states:

"Smoke contamination shall consist of burning pipe tobacco at an average rate of 0.63 gram of tobacco per pound of air and causing the effluent smoke to pass through the safety valve. The valve shall be subjected to contamination by smoke for a period of 15 hours . . ."

Many another paradox can be found in the specs that confront Whittaker alone — the valve that must operate in oil at minus 65 degrees (where undiluted oil has the consistency of Vermont marble); the motors and solenoids that must be capable of operating at impossible voltage ranges that would never be met in flight conditions . . .

Then there's the case of the valve which has given trouble-free service for years in an Air Force Transport — but which can never be qualified to the Military spec which was issued long after the last valves were placed in service.

Because of these practices by both military and prime, suppliers must take special pains to weed out exaggerations, file "exceptions," and thrash them out to the point of understanding and agreement before a unit is designed.

But sometimes the customer continues to demand the impossible, even though many such attainments may never be actually expected. And of course the cost goes up in proportion to the needless complexity of spec requirements.

A specification, after all, is essentially a statement of desirable effect, a guide to design and test to assure proper function within the limits of operation the unit must meet. There's no reason why specs should be exaggerated and complicated with unnecessary requirements that only cause the supplier to lose valuable time in a maze of paperwork.

Closer liaison between aircraft designers (and spec writers) and the supplier could reduce or eliminate much of the unrealistic material now included as a matter of course in specifications. Then there would be a basis for reasonable evaluation of the job to be accomplished, clear and uncluttered with inanities. Suppliers would not be forced into costly, time-wasting analysis now required to sift realism from irrationality.

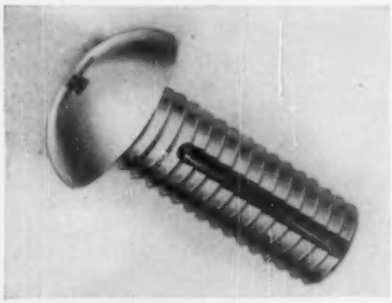
Whittaker realizes the delicacy of this subject and it is not their intention — nor mine — to place the responsibility for the present specification muddle on any particular doorstep. We do feel, however, that simplification must be actively sought if America is to receive a fair amount of aircraft for each defense dollar.

maker says.—George Scherr Optical Tools, Inc., 200 Lafayette St., New York 12, N. Y.

Homogeneous power motor-gear train, type 2094 for speed reduction covers any ratio from 3:1 to 10,500:1, according to the manufacturer. Typical weight is 10.5 oz. and measurements are 1¼-in. diameter and 3¼-in. length.—John Oster Manufacturing Co., Avionic Division, 1 Main St., Racine, Wis.

Course-and-Mile-gage, a navigation instrument designed for one-hand operation, combines 15 operations in one instrument, the maker reports.—Jimmie Mattern Co., Burbank, Calif.

Long-Lok vibration-resistant screw fastener, available from No. 4 upward, has a small cross-section longitudinal Kel-F



insert of high-temperature thermoplastic.—T. L. McKay & Co., Los Angeles.

Vane axial cooling fan for airborne electronic installations delivers 60 cfm. at 5 in. pressure water gage and 112 cfm. at 1 in., measures 7 x 4 x 5¼ in.—Ilg Electric Ventilating Co., 2850 N. Pulaski Rd., Chicago 41, Ill.

Separate microfilm recorder and reader are easily movable. Reader weighs 16.25 lb. and can read documents on 8-mm., 16-mm. or 35-mm. film. Indexing meter permits up to 999 locations on 100 ft. of film. Optional equipment includes a feeder for documents up to 11 in. wide.—Burroughs Corp., Detroit 32.

Precision mechanical differentials for calculating mechanisms are made in 48, 64 and 72 pitches, 20-deg. pressure angle, with 63 to 160 teeth. Units have three basic shaft sizes: ⅛, 5/32 and ¼-in. diameters.—Pic Design Corp., 160 Atlantic Ave., Lynbrook, L. I., N .Y.

Miniature pulse transformer for use in printed circuitry has pulse widths from 0.1 to 16 ms. and comes in two, three and four winding turns ratios. Available in standard seven and nine-pin pattern headers; can sizes range from 11/32 in. high x ½ in. o.d. to ⅝ in. high x ¾ in. o.d.—PCA Electronics, Inc., 2180 Colorado Ave., Santa Monica, Calif.

First American gas turbine engine to be licensed in Britain!

Edmund T. Price, Solar president and general manager (left), and W. T. Mattock, chairman and managing director of William Sugg & Co. Ltd., confer on facilities for British manufacture of Solar turbines.

Amazing Solar "Mars" makes more history

SOLAR'S SMALL GAS TURBINE ENGINES have received a unique tribute. The Mars 50 hp engine becomes the first American gas turbine design to be licensed in Britain. Solar management considers this new development a fine compliment. In the past, the traffic has all been in the other direction, with American firms using British designs.

With William Sugg & Co. Ltd., pioneer British gas engineers and manufacturers, a new company has been set up to be known as Sugg Solar Ltd. In a new British factory, Sugg Solar will build the Mars for its various present applications—in airborne auxiliary generator sets, portable fire pumps, and ground power units for aircraft. Sugg Solar is licensed also to manufacture new versions of the Mars as they are developed.

The Mars is a remarkable engine. It weighs less than 100 lb, is smaller than a two-foot cube, and operates at a speed of 40,000 rpm on natural gas, diesel oil, jet engine fuel, or high octane gasoline. Simple, easily maintained, light and compact, gas turbines are of growing interest to the aircraft industry. Write today for further information to Solar Aircraft Company, Dept. B-37, San Diego 12, California.

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Fuel Meter Shows Flow and Quantity

By George L. Christian

A new gravimetric flowmeter being installed in a top jet bomber and fighter can do two jobs: It gives flow readings in pounds-per-hour, or, as an integrating unit, serve as a fuel quantity gage. It is being used as a flowmeter in the bomber and as a fuel gage in the fighter.

The flowmeter has a range of 0-100,000 lb./hr. Among its features:

• **Accuracy** of ±5% of indicated values is claimed at low fuel flows. This jumps to ±2% at cruise fuel flows of 3,200 lb./hr./engine. A scale-change mechanism incorporating a solenoid-operated clutch is used to maintain accuracy over very wide fuel flow ranges.

The bomber's designers consider the fuel flowmeter as a primary engine instrument and demand corresponding accuracy.

• **Pressure** drop of the instrument is 0.7 psi. at a flow of 40,000 lb./hr. and approximately 4 psi. at maximum flow of 100,000 lb./hr.

• **Weight** of the transmitter is 6 lb., of the indicator 1 lb. In the supersonic bomber, four complete systems (one per engine) plus one total-flow indicator are used, for a weight of about 30 lb. (33.75 lb. is allowed by current procurement specifications).

• **Simplicity:** the only connections between the transmitter and remotely located indicator are three small-gage wires.

Instrument is now in pilot production at Control Laboratories, Inc., a wholly owned subsidiary of Avien, Inc., where the flowmeters will soon go into full production.

Why Flowmeters?

What are the advantages of the flowmeter type of fuel measuring instruments as opposed to the capacitance type?

Avien officials say the thinness and shape of supersonic fighters' wings may require an unreasonable number of fuel tank probes if capacitance-type gages are used.

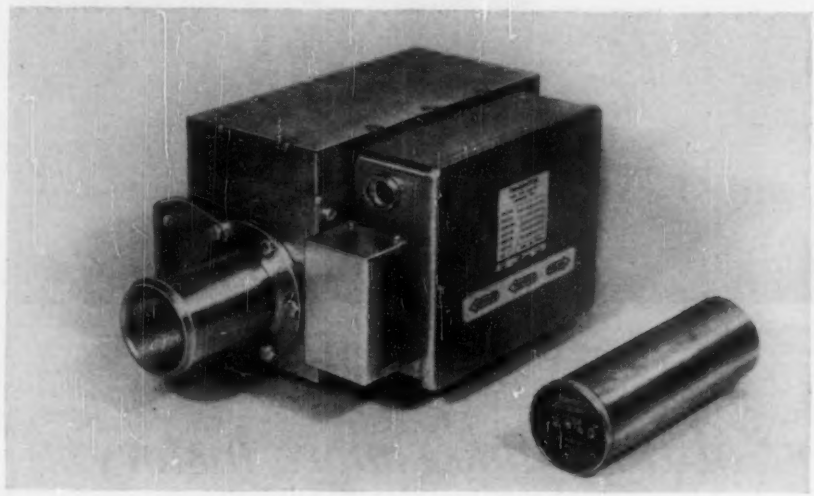
On one upcoming supersonic fighter being built on this continent, a study revealed that 70-odd wing probes would be required. Besides this large quantity of probes, other complications showed up. Among them: all wiring would be buried in the wing making it inaccessible; any failure means wing change.

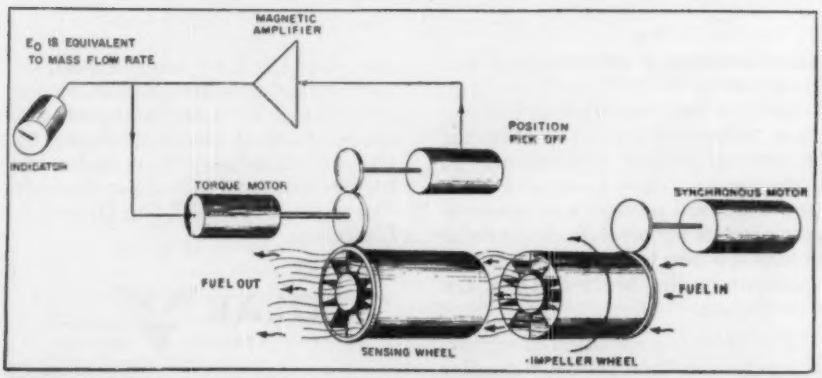
The flowmeter-type fuel gage may be installed in the same plane's existing fuel lines where they emerge from the wing into the fuselage, avoiding installing in the wing any additional equipment exclusively for fuel quantity gaging. Being located in the fuselage, the instruments may be made readily accessible.

When the unit is used as a fuel quantity gage, it is built as a bidirectional flowmeter. The device counts the pounds of fuel pumped into a tank. As fuel is used or transferred to fuselage tanks, the instrument counts the pounds of fuel leaving the tank, subtracts it from the total and shows fuel remaining in the tank on an easy-to-read digital counter.

To cancel out cumulative tolerances, the fuel gage-type instrument includes an automatic reset which zeros the indicator at the end of each cycle. Thus, the counter is automatically driven back to zero although a small quantity of fuel may still be indicated on the dial with the tanks dry.

Another aspect of the reset mechanism comes into play if fuel is dumped. The same signal that is used to dump fuel drives the counter back to zero at an accelerated rate equivalent to defueling at 200,000 lb./hr.





INTEGRATING GRAVIMETRIC FLOWMETER measures total fuel flow and provides indication of fuel remaining. Indicator uses counter type of presentation.

How It Works

Components which make up the Avien gravimetric flowmeter are two wheels through which the fuel flows—an impeller wheel driven by a synchronous motor and a sensing wheel geared to a torque motor.

In the case of a bidirectional unit, such as a flowmeter used as a fuel quantity gage, three wheels are used—two impeller and one sensing.

The impeller wheel imparts angular momentum to fuel passing through it. This impinges on sensing wheel tending to rotate it and buck the torque motor to which it is geared.

If the motor's torque does not equal

torque developed in the sensing wheel, a net torque results which rotates the gear train. A pick-off potentiometer, driven by the gear train, then develops a voltage. This voltage is sent to the magnetic amplifier, then is fed back amplified to produce an exact balance between the two torques, resulting in equilibrium of the system.

The same voltage being fed to the torque motor—which is directly proportional to the flow rate—is also fed to the indicating system. Indicator shows either flow rate or, through signal integration, quantity of fuel remaining in the tank. The latter type of indicator is a motor-generator used in a transistorized velocity servo circuit.

To maintain high accuracy over cruise flow ranges, yet allow metering of high flow rates, Avien uses a scale-change technique which incorporates an automatic gear change between the synchronous motor and the impeller wheel. Full output torque signal from the torque transducer is reached within cruise range.

For higher rates of flow, impeller wheel speed is reduced and full torque signal is again reached at the maximum flow rate. Gear change is made by a solenoid-operated clutch, energized at a predetermined flow rate, through a microswitch in the indicator.

Linear presentation may be used on the indicator with a vernier subdial. This is because when the impeller speed is changed in the transmitter the magnitude of the signal is correspondingly altered, so that there is no discontinuity between flow rate and signal strength to the indicator.

Avien has developed a means of canceling out potential errors resulting from cumulative, critical manufacturing tolerances which tend to show up in extremely high flow rates. The company also maintains optically precise tolerances in manufacturing to keep cumulative errors to a minimum.

Design Considerations

The flowmeter's dial indication is completely linear and a subdial gives maximum readability. Scale change has no effect on presentation.

Because indicator is servo motor-driven, ample torque is available to drive the subdial, and a warning microswitch if required.

The electronics portion of the instrument uses no vacuum tubes; magnetic amplifiers and high temperature, silicone transistors are used exclusively.

A parallel, adding network can be used in multi-jet aircraft to present total fuel flow on a single indicator. The totalizing indicator takes its signals from each individual transmitter prior to their being fed to an indicator; therefore the summation cannot reflect indicator errors or malfunctions.

Instrument uses a frequency compensating network which eliminates effects of frequency variations in the aircraft power supply. Therefore the system requires no special power supply and operates on the plane's 115-v., 400-cycle a.c. electrical system.

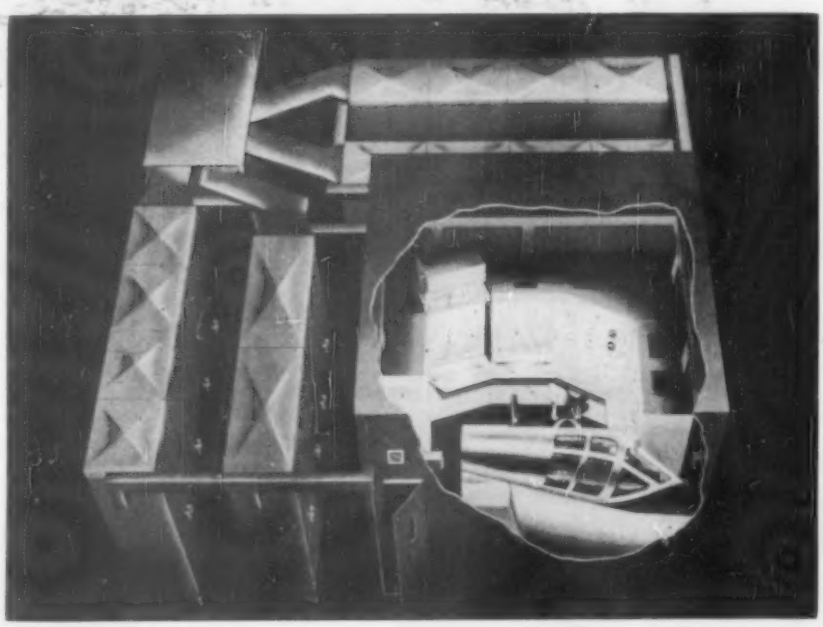
Transmitters and indicators are not matched and are completely interchangeable, simplifying maintenance and logistics. All adjustments are made at the factory where units are scaled to prevent tampering in the field.

The flowmeter's dimensions: transmitter—14⅜x6x6½ in.; indicator—2 in. dia., 5¾ in. long.

Friction Saw Speeds TWA Exhaust Repair

Engine exhaust collector rings are sawed apart in one-eighth the time previously required at Trans World Airlines' base at Kansas City, Kan.

TWA uses a new highspeed, friction saw which slices through Inconel alloy exhaust stack in 30 sec. Details of the Model 36-S DoAll Co. saw: blade speed movement—10,000 surface ft./min.; power—7½-hp. electric motor; 36-in. clearance accommodates entire collector ring.



USAF Getting F-102A Simulator

Latest in Link Aviation's line of flight simulators is a unit for the Air Force's supersonic Convair F-102A interceptor. Several simulators will soon be installed at Tyndall AFB, Fla.

Major deviation from usual simulator design practice in the F-102A device is a switch from a.c. to d.c. current.

Link says the change makes possible more accurate computing over a greater range of aerodynamic variables and more precise and realistic simulation of the plane's response to control forces and atmospheric disturbances—important considerations in supersonic training devices.

Corollary benefits of using d.c. computation are reduction in number and size of amplifiers, greater component standardization and a generally more efficient operation, according to the manufacturer.

A flexible linear interpolator system, developed for the F-102 simulator, makes possible more accurate calculations of such variables as engine thrust, fuel flow and pressure ratio, which are arbitrary functions of as many as three other variables. Link says that previous standard techniques made such accurate calculations impractical.

Switching facilities have been provided to switch simulator from manual operation to autopilot. The simulator incorporates an F-102A cockpit, instructor's jump seat and an operator's position and control panels. Three automatic recorders keep track of ground position, azimuth and range, and altitude and glide path. The entire "training area" is air conditioned.

Outside are two double rows of steel cabinets housing the simulator's electro-mechanical equipment. Accessibility of components and ease of maintenance have been bettered by using revolving amplifier racks mounting plug-in type amplifiers.

Simulator was developed by Link in cooperation with Wright Air Development Center and the Air Research and Development Command.

OPINDOC

Combine the experience and confidence of a battle-trained jet ace, the scientific approach of a test pilot and up-to-the-minute knowledge of what makes a Scorpion F-89D interceptor "tick" and you have the Northrop Operational Indoctrination man. "Opindoc" men are among the many types of Northrop field specialists who work with Air Force pilots and technicians to develop peak tactical superiority for the rocket-armed Northrop Scorpions which now form our first line of defense against enemy air aggression. Their counsel is an important part of weapons system engineering at Northrop Aircraft. Northrop is producing the famous Scorpion F-89 series; a new intercontinental A-bomb carrier, the Northrop Snark SM-62 pilotless bomber; and many other closely-guarded weapons for America's arsenal of defense. In accomplishing such strategic objectives Northrop has, since 1939, led the world in the design and production of all-weather and pilotless aircraft.

NORTHROP

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High-Capacity Fans Need Little Power

A new line of axial-flow blowers for air, sea, ground and industrial applications, provides high air capacities but has low power requirements. Fans are manufactured by Pesco Products under license from the English firm, Plannair, Ltd.

The fans come in several sizes, with rated capacities ranging from 16 to 750 cfm.

Principal airborne uses are for ventilating avionic gear, cockpits and cabins, recirculating air in passenger aircraft, defrosting windshields, spot ventilating uses, and cooling helicopter engine oil.

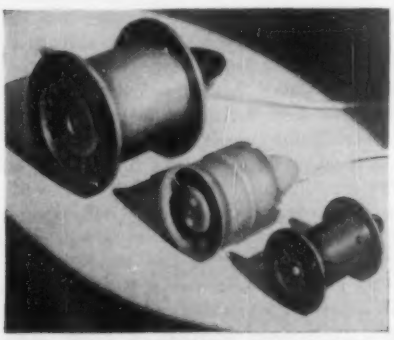
The smallest blower in the line measures 1⅜ in. in diameter, weighs 8 oz. and delivers 16 cfm. of air at 0.75 in. of water. The Pesco electric motor driving the blower measures less than 1 in. in diameter.

Other standard production units will range up to 6 in. in diameter, will be available as single or multi-stage blowers and will be powered by either a.c. or d.c. Pesco motors.

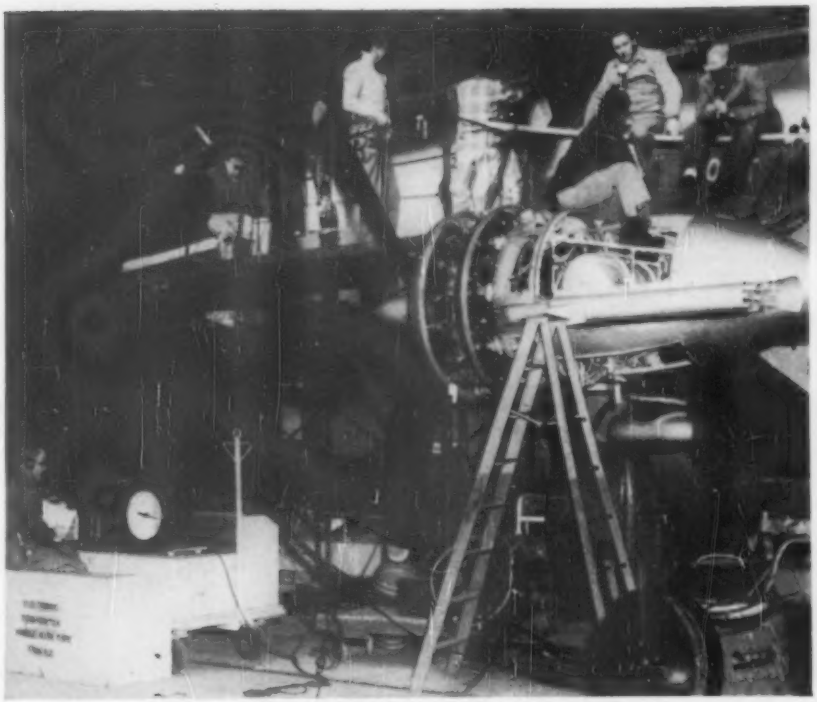
The blowers are designed for rugged duty, to withstand severe conditions of shock, temperature, pressure, altitude and humidity and are rated for continuous operation at high ambient temperatures.

Pesco says compact design and light metal construction allow high air displacement with minimum size and weight. Power losses are kept at a minimum and space savings are made possible because the units may be mounted within a duct system. Blower assemblies are dynamically balanced for smooth, quiet operation.

Units are supplied with either flange or clip mountings, will operate in any position and use low temperature grease in sealed, precision bearings for reliable high altitude operation. Either totally enclosed or explosion-proof motors are available.



AXIAL-FLOW BLOWERS made by Pesco under license from British firm, Plannair, Ltd. Center blower is designed for clip mounting; other two for flange mounting. Position has no effect on rated efficiency.



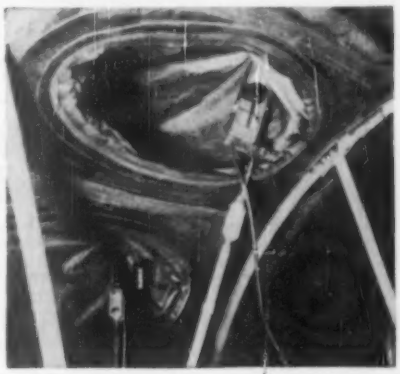
Strain Gages Check Airship Cable Tension

New system of applying tension to the steel cables that support airship cars speeds up the job and greatly improves accuracy.

On a lighter-than-air ship such as the ZSG-3 scout blimp shown here, most of the load is carried by four longitudinal "catenary curtains" to which are attached flexible steel cables leading from 23 suspension points on the airship car to 72 equally spaced concentration points on the catenary curtains. Proper tensioning of the cables is important for correct distribution of the load on the 527,000-cu. ft. ship.

By using Baldwin-Lima-Hamilton SR-4 tensiometers incorporating SR-4 strain gages, the job can be done by four or five men working the turnbuckles in three hours, following a one-hour set-up period by two men. Previously it took a full day. Accuracy is held within ½% or 5 lb.; it used to vary from 10 to 15%.

Each tensiometer is connected by electrical cable through a 24-point switching unit to a direct-reading tension indicator, where the supervisor controls adjustments made by turnbuckle crews. The instruments are kept in a plywood cabinet mounted on a rubber-tired wagon.

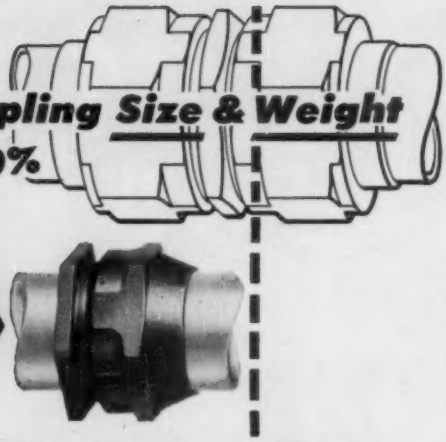


OFF THE LINE

Dumont Aviation Associates has purchased Industrial Associates, Inc., and is transferring all personnel and physical assets of the latter from Los Angeles International Airport to Dumont's Long Beach, Calif., facilities. Industrial Associates will continue as a division of Dumont. It specializes in airframe and accessory replacement parts for DC-3, -4 and -6 airplanes.

Republic Aviation test pilots have made over 120,000 takeoffs and landings from their Farmingdale, N. Y., airfield and have flown over 50,000 hours during the past 10 years without damage to any neighbor's person or property, the company says.

New high-temperature gasketing felts for aircraft and guided missiles are being produced experimentally by du Pont's Fabric division. Material is made of Teflon polytetrafluorethylene fiber impregnated with Teflon resin. Nonwoven felts can withstand temperatures up to 400F almost indefinitely and can be boiled in aqua regia or fuming sulphuric acid without adverse affect.



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BuAer Contracts

The following contract awards of $25,000 and more have been announced recently by the Bureau of Aeronautics, Department of the Navy, Washington 25, D. C.

Academy Pictures, Inc., 588 Fifth Ave., New York 36, preparation of three master shooting scripts with complete storyboards for motion picture training films, $38,528.

Arthur D. Little, Inc., 30 Memorial Drive, Cambridge 42, Mass., conduct an investigation of major factors which relate to the deterioration of rubberlike materials in storage, $49,214.

Bendix Radio Div., Bendix Aviation Corp., Baltimore 4, automatic direction finders and spare parts, 4 ea., $47,812.

Chicago Aerial Industries, Inc., 1980 Hawthorne Ave., Melrose Park, Ill., service change kits of 159 parts for the installation of forward firing K-36 in, and Mitchell 35-mm. cameras on F2H-2P aircraft, $114,171.

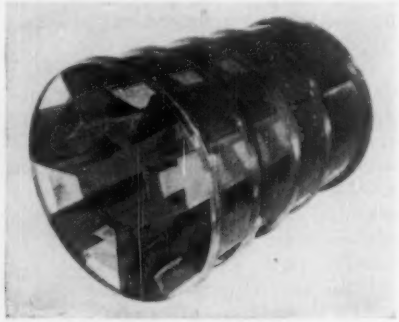
Jam Handy Organization, Inc., 2821 East Grand Blvd., Detroit 11, preparation of the scripts with partial storyboards for 12 motion picture training films, $62,833.

Radio Corp. of America, RCA Victor Div., Camden 2, N. J., synchronizer modification kits, 880 ea., $82,201.

Jack & Heintz, Inc., Cleveland 1, electric direct cranking starters, 1,030 ea., $354,043.

Test Institute Corp., 3188 West 32nd St., Cleveland 9, conduct test on 20 GF fuel and oil quick disconnect couplings and 80 GF couplings, 100 ea., $25,484.

University of Miami, Inc., Miami, Fla., conduct a comparative study on the effectiveness for weather detection of the SP-1M, S-Band radar and AC-Band which shall include both PPI & RHI presentations of subtropical weather phenomena, $32,447.



Corrugated For Silence

First flight tests of this new "corrugated nozzle" developed as a jet engine silencer by Rolls-Royce, Ltd., will be made soon on a de Havilland Comet. Noise reductions of 11 to 12 decibels have been obtained on the test stand; this reduction means that the noise level is reduced about half. The six-corrugation nozzle was found to give the largest reduction in the loudest part of the jet noise after development trials with nozzles containing as many as 60 corrugations. Rolls says these nozzles do not affect engine performance. The silencing program has been under way at R-R as well as at other engine manufacturers for about four years under Ministry of Supply contract. Rolls-Royce says that when optimum point in the development of these noise reducers is reached, production will be arranged and engines fitted with the nozzles will be made available.

A new kind of oil for a new kind of flight

Capital Airlines' swift new turbo-prop Viscounts are lubricated with an oil that didn't even exist until a few years ago.

Engineers who were then designing advanced turbo-prop and turbo-jet engines ran into almost insurmountable difficulties: there just wasn't an oil that could meet the tough lubrication specifications of the proposed engines.

Esso research teams went to work on the problem. They produced a *synthetic* oil which was named Esso Turbo Oil 35. This oil not only lubricates the famous turbo-prop Viscounts, but is used also in advanced jet aircraft.

This triumph of Esso research adds one more chapter to an already splendid record in the development of new products for civil and military aviation.

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Size 15
1.437" diameter
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ACTUAL SIZE
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To: Sales Department
Subject: Size 8 and 22 Synchros
As promised last November, our size 8 and 22 standard synchros are now in production and available for 3 weeks or less delivery.
In addition, we have added the BuOrd type size 15 transmitter to the line.
Next
BuOrd Size 15
1.437" diameter
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HERE!
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.750" diameter
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Navy Contracts

Contracts recently announced by the Navy's Aviation Supply Office, 700 Robbins Ave., Philadelphia 11, are:

AiResearch Mfg. Co., 9851-9951 Sepulveda Blvd., Los Angeles 45, shaft drives, 23 ea., $61,242; valves, thermostat and regulator assys., $60,021.

Arrow Lacquer Corp., 208 Dupont St., Brooklyn 22, N. Y., lacquer, 49,000 gal., $104,125.

B. F. Goodrich Co., 500 S. Main St., Akron 18, Ohio, boots, deicer, $37,615.

Bristol Co., Aircraft Equipment Div., Waterbury 20, Conn., controls, 55 ea., $28,741.

De Priest Machine Shop, 5512 E. 11th St., Tulsa 12, Okla., tow bar assys., 10,000 ea., $36,100.

Fairchild Engine and Airplane Corp., Orinico Dr. and Manor Lane, Bay Shore, L. I., N. Y., supercharger assys., 21 ea., $46,347.

Flexible Tubing Corp., New Whitfield St., Guilford, Conn., tubes, $67,019.

General Paint Corp., 2627 Army St., P.O. Box 3474, Rincon Annex, San Francisco, Calif., lacquer, 21,000 gal., $40,950.

H. W. Loud Machine Works, Inc., 969 East 2nd Street, Pomona, Calif., cylinders and valves, 419 ea., $168,364.

Industrial Hard Chrome Plating Corp., 1401 Park Ave., Emeryville 8, Calif., services and material, 4,000 ea., $139,400.

Jack and Heintz, Inc., 17600 Broadway, Cleveland 1, Ohio, generators, 293 ea., $94,255.

Lite Mfg. Co., 101 W. 21st St., New York 11, target assys., 10,964 ea., $627,141.

Millivac Instrument Corp., 444 Second St., Schenectady 6, N. Y., voltmeter, vacuum tube, $30,124.

Technicraft Laboratories, Inc., Thomaston, Waterbury Rd., Thomaston, Conn., couplers, 629 ea., $27,783.

United States Gauge Div., American Machine and Metal, Inc., Sellersville, Pa., transmitters, 459 ea., $34,902.

Westinghouse Electric Corp., 3001 Walnut St., Philadelphia 4, services and repair parts for government owned engines, 6 ea., $199,011.

Weston Electrical Instrument Corp., c/o Joralemon, Craig and Co., 101 N. 33rd St., Philadelphia, indicators, 1,129 ea., $32,910.

Portable Servicer

This portable hydraulic unit is designed to service aircraft hydraulic systems and handle general oil transfer. Its lever-operated diaphragm pump delivers fluid at approximately 16 gpm. through a 10-ft. flexible hose and a self-closing nozzle. Unit has been service-tested by several aircraft companies, says its manufacturer, Harman Equipment Co., 3605 E. Olympic Blvd., Los Angeles 23, Calif. The standard filter element strips water and removes solids from oil down to 10-micron size.

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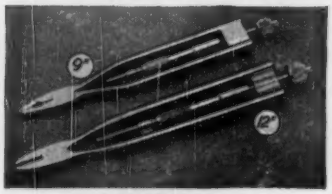

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Traffic Control by Machine

Finding new words with which to stress the importance of air traffic control is nearly impossible. Fortunately it may not be necessary. By this late date just about everybody realizes that an efficient system is vital to the growth of aviation.

Much headway has been made in recent years. The use of radar has given controllers a most useful tool. The use of multiple routes, one-way traffic and restrictions on altitudes have likewise added to the flow of traffic.

No Middlemen Wanted

The newest wrinkle (although it was planned years ago) is the feature of having pilots talk directly to the controller. Until this innovation came about several "middlemen" were required for relay purposes. Using this older method the average one-way time for a clearance message was 12 minutes. This placed a low limit on the aircraft a given airway could contain.

So progress is being made although even those closest to the work are the first to admit that we still have a long way to go.

Now despite this rather optimistic talk about progress there are indications that a word of caution is needed to those engaged in designing our traffic systems. That word is that traffic control is not the ONLY problem connected with moving an aircraft from here to there.

The point is that at times we seem to be engaged in building an inflexible monster of a machine in which efficiency is the watchword and with which clearances will be stamped out without regard for individualities.

Right here I suppose there will be screams to the effect that this so-and-so pilot is now condemning a process because it is too efficient and he wants individual attention.

Well, pilots learn very early in life that no two flights are ever exactly alike. They learn that they are dealing not with parts moving down an assembly line but with loads of live people whose comfort and safety take a wide precedence over "on time" arrivals.

Efficiency vs. Flexibility

Unquestionably a rigid, cut-and-dried procedure will appear to move more units. But the procedure may not always be tolerable for each flight.

Right now for instance, an aircraft flying over New York cannot get a lower altitude than 10,000 feet regardless of the fact that the lower levels may be vacant or that icing conditions or thunderstorms make 10,000 well nigh intolerable. In other areas a flight may be confined to a lower altitude when a higher one would be better.

And the same situation exists as to routes. A northbound flight will be confined to the appropriate routes, from the traffic control standpoint, regardless of the fact that flight conditions and the flight plan call for another airway.

These various thoughts are not an attempt to belittle the sincere efforts of many people and the strides they are attempting to take. But in the quest for precision in quantity great care must be taken to avoid assembly line—moving belt—techniques where every move made is to an inflexible plan.

The time has not come when en route weather conditions can be totally disregarded in the interests of traffic movement. And the necessity of radio position reports every three or four minutes does not lend the pilot much spare time to consider the needs of his passengers.

The airline industry prides itself on being able to give its customers safety, comfort and scheduled rides. Let it not be said that we are tooling up a machine which will reverse the logical order of these three items. In the long run such a scheme might lose more passengers than it would gain.

Martin "404"—Courtesy of The Glenn L. Martin Company

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Examiner Backs Air Charter Exchange

Failure to relax present irregular restrictions would be 'tragically shortsighted,' says CAB's Pfeiffer.

By Craig Lewis

Washington, D. C.—Temporary approval of air charter exchange proposals made by Aircoach Transport Assn. and Independent Military Air Transport Assn. has been recommended by Civil Aeronautics Board Examiner Paul N. Pfeiffer.

In his report, Pfeiffer observes that the airlines are enjoying a period of general prosperity and says that failure to relax some of the restrictions on irregular commercial operations so the industry can attain a firmer economic foundation without cost to the taxpayer in such a period would appear to be "tragically shortsighted."

Pfeiffer says that a substantial air charter passenger and freight potential exists which is not presently being served by the certificated carriers "which are properly tethered to the demands of the scheduled service." He recommends development of this potential through use of the ACTA and IMATA exchanges for an experimental three year period.

The report would authorize use of solicitation facilities of the two exchanges for both passenger and freight charters in domestic service and freight charters only in overseas service.

No Competition Restraint

In relation to anti-trust considerations of approval of the exchanges, Pfeiffer says: "The pooling of irregular air carrier charter facilities into two organizations would not serve to restrain required competition in a substantial segment of the airline industry.

"Rather, similar to the Nash-Hudson and Studebaker-Packard mergers in the automotive industry (which the Department of Justice has apparently approved) the two proposals may greatly improve the efficiency, economy and public acceptance of irregular air charter operations so as to increase rather than decrease the effectiveness of competition between the irregulars and the certificated airline industry."

Pfeiffer finds that the evidence in the investigation favors the proposition that a primary purpose of the clearing houses is to lower the cost of charter air transportation to the Defense Department in particular and traveling and shipping public in general by reducing ferry mileage and layover charges through close operational coordination of member carriers.

"Finally," he says, "approval of both association proposals would, if anything, intensify competition among the irregulars by introducing a degree of rivalry for commercial charter procurement on a nationwide scale not presently evident."

At the end of 1954, the ten eligible members of IMATA owned or leased 76 aircraft. The thirty eligible members of ACTA had 89 aircraft on the same date.

Charter Restrictions

The report recommends that ACTA, but not IMATA be allowed to operate less than planeload charters through its clearing house subject to the following restrictions:

- **For passenger charters**, a maximum of two groups per DC-3; three groups per C-46, Martin 2-0-2 and 4-0-4 and Convair 240 and 340; and four groups per DC-4 or larger aircraft.
- **For freight charters**, a maximum of two loads per C-46, three loads per DC-4 and four loads per DC-6A, Constellation and various larger aircraft.

The certificated carriers which are members of IMATA would be excluded from participation in the operation of the air exchange. These include the Flying Tiger Line, Slick Airways, Acrovias Sud Americana and the newly certificated Seaboard and Western Airlines. Part 45 operators would also be excluded.

Frequency Limits

Pfeiffer would establish frequency limitations which would allow daily flights between the same pair of points of:

- **Passenger:** One DC-4 or larger aircraft; two C-46, Martin 2-0-2 and 4-0-4 or Convair 240 and 340 aircraft; or three DC-3 or C-47 flights.
- **Freight:** One DC-4 or larger aircraft; two C-46 or three DC-3 or C-47 aircraft.

Frequencies would be subject to adjustment on petition after a year of operation under the air exchanges. Unused frequencies could not be accumulated, but where a chartering organization required more than one plane, additional aircraft would be treated as extra sections.

Under the terms of Pfeiffer's conclusions, chartering organizations would have to be pre-existing and formed for

Turboprop YC-97J Logging Up Test Time

One of the two Boeing Stratofreighters modified to YC-97J configuration as flying testbeds for the Pratt & Whitney T34 turboprop engine is shown during recent test flight. Installation of the four 5,700-eshp. T-34s is said to give the plane 63% more power with 5,000 lb. less empty weight than piston-powered C-97s.

a purpose other than the requested charter. No special restriction would be applied to pro rata charters.

Neither the clearing houses, nor their members through them, would be allowed to pay commissions to ticket agents, nor would they be allowed to accept charters offered through any ticket agent or tour conductor.

No limitations would be applied to charters by air freight forwarders or cooperative shippers' associations.

Participation Deferrals

Approval of the participation of eight ACTA carriers involved in CAB enforcement cases would be deferred by the examiner. "Until the carriers named have survived the serious implications of these charges by dismissal of the complaint or the entry of cease and desist orders by consent or otherwise, it would not be in the public interest to enlarge their operating authority and consequently their opportunity to violate by permitting use of the clearing house facilities."

Carriers involved in enforcement proceedings are: Aero Finance Corp., Peninsular Air Transport, Currey Air Transport, Great Lakes Airlines, Hemisphere Air Transport, Trans-American Airways, Trans-National Airlines and Twentieth Century Airlines.

The regulatory status of the irregular carrier members of ACTA and IMATA are currently a primary issue in the Large Irregular Case. Operation of the air exchanges depends on the final determination of that case, as well as the action the CAB decides to take on Pfeiffer's recommendations.

A number of intervenors in the air exchange investigation maintained that it should be held up pending final decision in the Large Irregular Case.

Integrated Operations

The CAB investigation of the air exchange proposals was instituted in March, 1954 to consider plans submitted by ACTA and IMATA for traffic clearing houses. Under the plans, commercial charter operations would be integrated with existing military charter operations set up for Civil Air Movement from the military agencies.

The ACTA commercial charter clearing house would be in Washington, D. C. Field offices would be maintained in Newark, Baltimore, Columbia, S. C., Miami, New York, Chicago, Denver, San Antonio, Fort Smith, Houston and Seattle. Local offices would be established in Oakland, San Francisco, Burbank, San Diego and Pearl Harbor.

IMATA's military exchange is in Washington. Field representatives are located in Miami, San Antonio, Fort Worth, Nashville, Trenton, Burbank, San Francisco, Oakland, Lafayette, Ind., New York, Windsor Locks, Conn.

Piasecki Aims for 1956 Delivery Of PH-42 Commercial Helicopter

Price tag on the projected commercial version of Piasecki Helicopter Corp.'s tandem-rotor military H-21 will be approximately $270,000. Designed to seat 19 passengers over a range of approximately 340 mi., the PH-42 is undergoing Civil Aeronautics Administration certification procedures and will be available for delivery beginning next year, Piasecki reports.

New York Airways and Sabena Belgian Airlines are evaluating the PH-42 proposal. First details of the new helicopter were reported exclusively in Aviation Week May 23, p. 107. NYA President Robert L. Cummings, Jr., then said he was studying the piston-powered rotary-wing transport along with a civil version Sikorsky's single-rotor S-58.

NYA personnel have flown in a military H-21 counterpart of the PH-42, according to Piasecki. The company built a partial full-scale mockup of the design for inspection by prospective customers at its Morton, Pa., plant. The mockup comprises the 20-ft.-long cabin section with passenger seats installed. Cabin will be 5-ft. 8-in. wide and 5-ft. 10-in. high.

The civil PH-42 will be available in a variety of seating arrangements from a standard 19 passenger configuration to a 16 place de luxe version. The interior will be convertible to allow cargo stowage. Double entrances on opposite sides of the cabin will permit simultaneous loading of cargo and passengers —or in a passenger version will speed entry and exit to shorten ground time between stops. Both entrances will be fitted with retractable step-doors.

A detachable 80-cu.-ft. Helipack beneath the fuselage could be used for mail and baggage stowage.

Industrial users are being sought by Piasecki, which says that the PH-42 is adaptable to mining operations, offshore oil drilling, handling lumber and construction. Bulk loads up to 4,500 lb. could be carried in a sling from under the fuselage. In military demonstration, the copter has towed Navy mine sweeping equipment and freed trucks mired in sand (AW Mar. 21, p. 19).

This ability could be used to tow bogged-down equipment in swamp areas, tug loads over snow and ice and tow barges.

The PH-42 is scheduled to be powered by a Wright 8639HD-1, civil version of the H-21's R1820-103, rated at 1,425 takeoff horsepower. A 300-gal. fuel tank will be located aft of the passenger compartment and separated from the power plant by a stainless steel firewall.

Piasecki PH-42 Specifications

High speed at sea level	131 mph.
Cruise for best range (sea level)	98 mph.
Max. rate of climb	1,080 fpm.
Service ceiling	9,450 ft.
Fuel consumption at cruise	69 gal./hr.
Range (with 300 gal.)	338 mi.
Center of gravity range	41.5 in.
Gross weight	13,300 lb.
Empty weight	8,730 lb.
Passengers, baggage, fuel, oil & crew	4,570 lb.
Overall length (rotors turning)	86'4"
Fuselage length (blades folded)	52'6"
Width (blades folded)	14'4"
Overall height	15'5"
Rotor dia. (blade tip circle)	44'0"
Seating capacity (crew)	2
Seating capacity (passengers)	19
Cabin capacity	615 cu. ft.

CAB Cuts Mail Pay

Civil Aeronautics Board has proposed a reduction in mail pay for Northern Consolidated Airlines for this year and future periods.

The new rate tentatively adopted by CAB would furnish Northern Consolidated an annual mail pay of $1,040,176, which includes a breakeven need of $916,974 and a return on investment of $86,697. This rate yields about $305,000 a year less than the past rate.

Northern Consolidated would receive service mail pay of $265,740 annually, leaving a subsidy element of $774,436.

Mail Case Reopened

Service mail rates for local service airlines have been reopened and a mail rate proceeding instituted by the Civil Aeronautics Board.

Present mail rates of the local airlines were set Oct. 1, 1953, based on the 45 cent ton-mile rate then effective for the big four trunk-line carriers.

CAB says preliminary examination indicates local service carrier costs have changed considerably since the current rate was set. The Board also wants to revise the local service mail rate structure to make it consistent with the multi-element rate structure set last month for the trunk carriers.

The local service mail rates are reopened effective July 1, 1955.

Qantas Buys 1049Hs

Qantas Empire Airways, Australia, has ordered the first two new Lockheed 1049H Super Connie freighters for a Sydney-London service starting in mid-1956.

Detailed specifications of the 22nd version of the Constellation were exclusively reported in Aviation Week, June 27, p. 91. Seaboard & Western Airlines, Flying Tiger Line and Slick Airways also are interested in the new plane.

Featuring a specially stressed fuselage capable of taking 20-ton payloads, the 1049H will be powered by four 3,250-hp. Wright Turbo Compound engines and has a design top speed of 370 mph. Nonstop maximum range will be 5,580 mi.

Prop Change Ordered For PAA, Northwest

Pan American World Airways and Northwest Airlines have been instructed to replace hollow blade propellers on Boeing Stratocruisers by the Civil Aeronautics Administration.

The two carriers have been told by Civil Aeronautics Administrator Fred B. Lee to replace Hamilton Standard propellers having 2J17 hollow steel blade with solid metal blades. Replacement will be made as soon as a solid blade propeller can be supplied by the manufacturer. Rigid inspection procedures prescribed by the CAA must be maintained until the hollow blades are replaced.

The hollow Boeing 377 propeller has been blamed for a number of Stratocruiser accidents and incidents (AW May 9, p. 18), most of which involved loss of an engine. Latest incident was the crash last March of a PAA Stratocruiser near Portland, Ore.

Cargo Rates Reduced

Dispute over trans-Atlantic cargo rate reductions has been resolved with the agreement of International Air Transport Assn. members to make the new rates effective Aug. 15 (AW June 13, p. 135).

New tariffs will reduce rates an average of 20%, with some commodity rates being cut as much as 47%. Simplification of the commodity rate structure will reduce hundreds of commodity descriptions to 48 classifications.

A dispute among North Atlantic carriers arose when Pan American World Airways announced plans to make the reductions effective July 1. Other Atlantic carriers, led by KLM Royal Dutch Airlines, objected to certain aspects of the PAA plan.

Larger CAA, CAB Appropriations Voted by Congress for Fiscal '56

Washington, D. C.—The Fiscal 1956 budgets for Civil Aeronautics Administration and Civil Aeronautics Board approved by Congress—$160 million for CAA and $56.6 million for CAB—are substantially more than the Fiscal 1955 budgets.

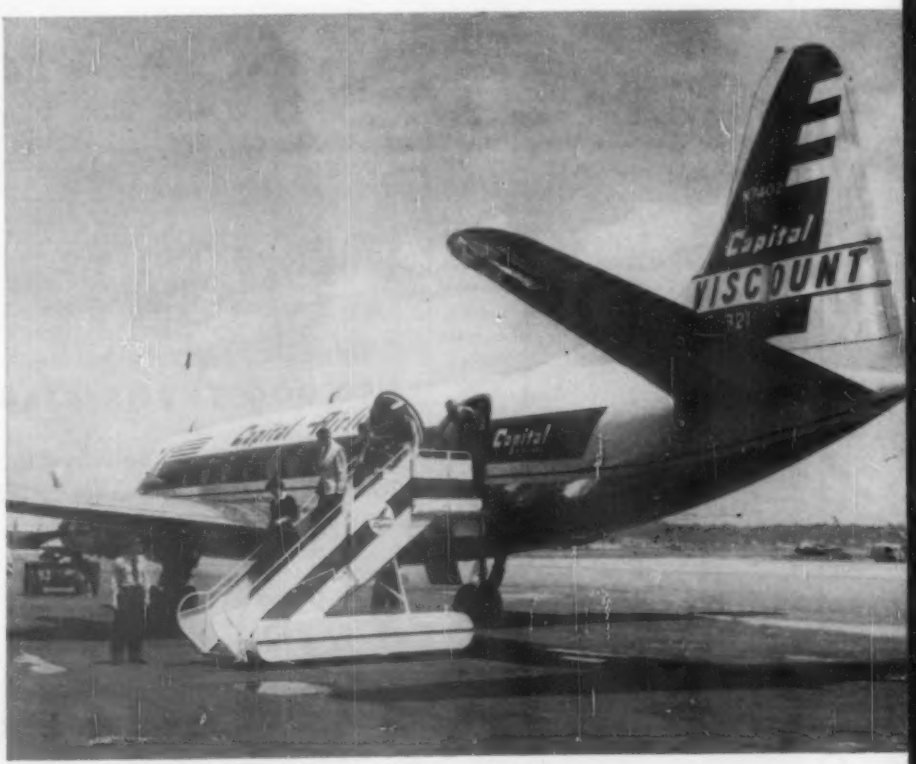
- **CAA's allocation** is $30 million over the Fiscal 1955 budget of $130 million.
- **CAB's allocation** is $4 million over the $52.6 million allocation for Fiscal 1955. This includes $4,125,000 for administration (compared with $3,777,000 for 1950) and $52,500,000 for airline subsidy payments (compared with $48,900,000 for 1955).

The $338,000 increase in administrative funds will permit the Board to speed action on the backlog of route and mail cases (AW June 6, p. 130).

The allocation for subsidy payments is $10.5 million less than the $63 million the Board requested. But members of both House and Senate have stated that if additional money is going to be needed, funds could be appropriated next year.

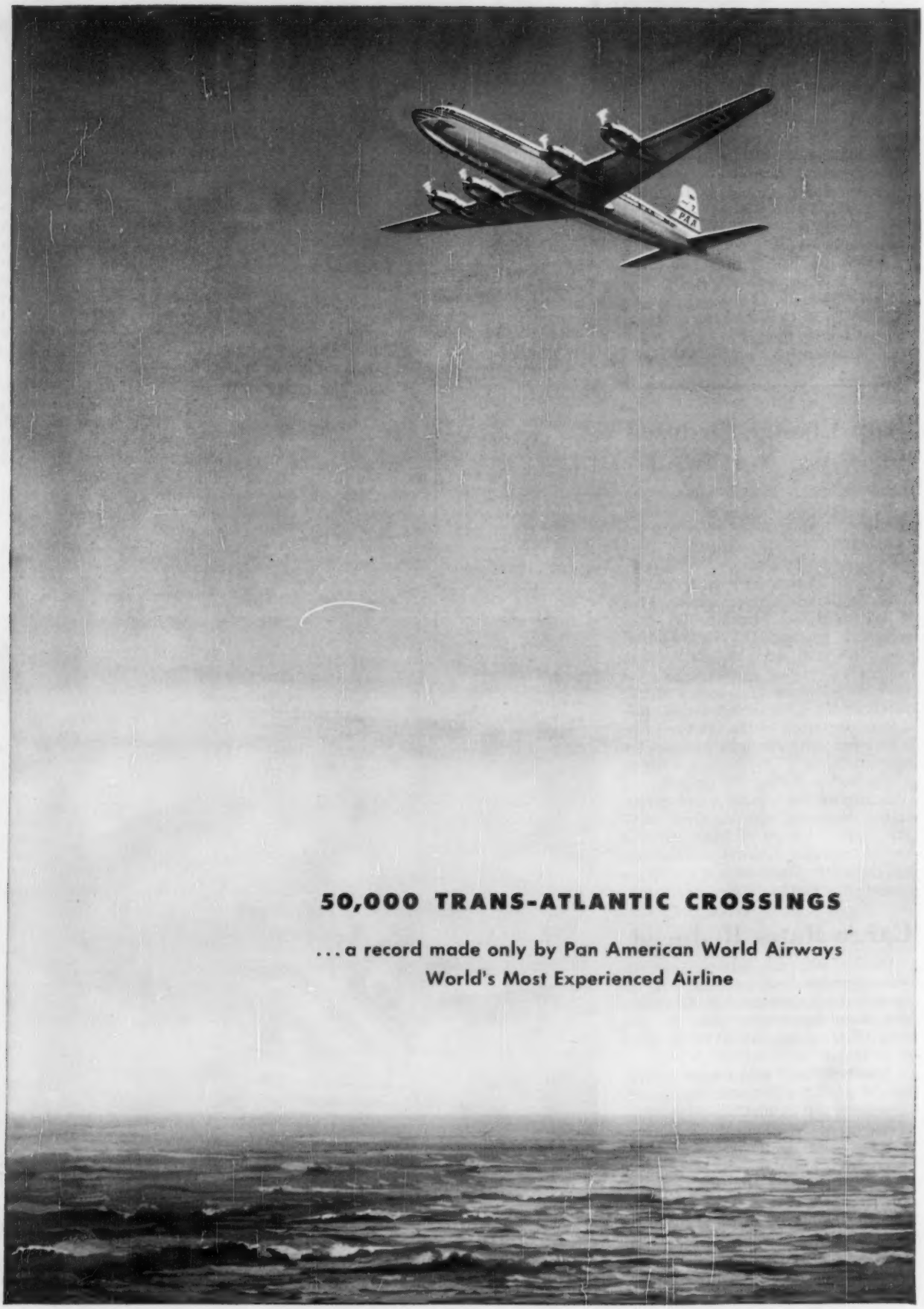
The CAA budget includes funds for these activities:

- **Operations and regulation,** $106 million, the amount requested. The House and Senate conferees directed that "no stations or facilities now operating be discontinued by the CAA, until after there is reported for consideration of the appropriations committees of the Senate and the House a comprehensive plan for future air traffic control routes, facilities, and stations. In any event such a plan shall be submitted prior to the consideration of the budget for Fiscal 1957."
- **Establishment of air navigation facilities,** $16 million, $2.5 million less than CAA's request. The reduction was made to keep new facilities at a minimum until an agreement on a common system of navigation is finally made.
- **Federal airport aid,** $20 million, almost double CAA's request for $11 million (see p. 83).
- **Air navigation development,** $1 million, or half CAA's original $2 million request.



Capital Introduces Viscount

Inaugural passengers deplane from Capital Airlines' first Vickers Viscount turboprop-powered transport at Washington National Airport after demonstration flight. Capital will put the British-built transport into scheduled service July 26, when it will become the first U. S. airline to operate turboprops. It has ordered 60 Viscounts at total cost of $67.5 million. The 48-passenger Viscount is powered by four 1,550 eshp. Rolls-Royce Darts.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$63 Million Annual Airport Aid Wins Unanimous Senate Approval

Washington, D. C.—Legislation guaranteeing $63 million federal aid for airport development annually for the next four years was unanimously passed by the Senate—despite the Administration's oppositions.

Under the measure, Civil Aeronautics Administration would be authorized to enter contracts with state and local governments each year—for Fiscal 1956 through Fiscal 1959—up to $63 million, and Congress would be obligated to appropriate funds to cover the contracts. Up to now, under the terms of the 1946 Airport Development Act, CAA has had to obtain appropriations first, before contracts could be made.

If the measure is enacted, $83 million would be available for Fiscal 1956 aid: the $63 million authorization—$60 million for continental projects and $3 million for territorial projects, plus $20 million in a direct appropriation already approved by both House and Senate (AW June 27, p. 11).

No word of opposition was expressed during brief Senate consideration of the measure which was introduced by Sen. Mike Monroney (D.-Okla.), chairman of the Senate Commerce Aviation Subcommittee. Two Republican senators—Frederick Payne (Me.), a member of the Senate Commerce Committee, and Frank Barrett (Wyo.)—joined Monroney in urging its enactment.

Ground Facility Needs

In his Senate presentation, Monroney stressed the urgency of improving facilities for jet aircraft and cargo operations (AW May 9, p. 111).

"Time is moving rapidly against us in modernizing the airport program," Monroney said. "Only seven civilian airports in the U. S. can accomodate jet propelled transportation planes. Yet in one, two or three years, airlines will be ready for such service, and there will be no airports to accomodate such planes . . ."

"Modern, speedy ground facilities for handling air freight are necessary for the development of this type of air transport and should be undertaken as rapidly as possible," he continued. "Today the lack of adequate labor saving and time saving devices in the handling of air freight holds back this development which will advance aviation still farther in its service to all types of transportation."

The legislation explicitly states that federal airport aid shall be available for "the construction, alteration, and repair of airport passenger or freight terminal buildings and other airport administrative buildings" and "shall not be limited to any classes or categories of public airports." These provisions would void the administrative rulings of the Commerce Department for the past two years banning federal aid for terminal facilities and small airports

Conflicting Views

Civil Aeronautics Board Chairman Ross Rizley has given general support to the purpose of the Monroney bill: a sharply accelerated, stable airport program.

Under Secretary of Commerce for Transportation Louis Rothschild, speaking for the Administration, opposed the bill's method of accomplishing a "stable program."

He also maintained that federal airport funds should continue to be a matter of annual appropriations (AW June 13, p. 131).

Monroney told the Senate: "The Commerce Committee is completely in disagreement with the views of the Administration and the Department of Commerce as to these features of the bill and is extremely disappointed that the Administration and the department have taken the position."

Monroney recounted the instability there has been under the system of annual appropriations:

In 1953, "the entire program was shut down as the Secretary of Commerce conducted a survey to determine the need for federal assistance in public airport development. Despite the fact that many states and cities were in the midst of planning airport work, or in completing financing arrangements, the program was shut down in its entirety for one full year.

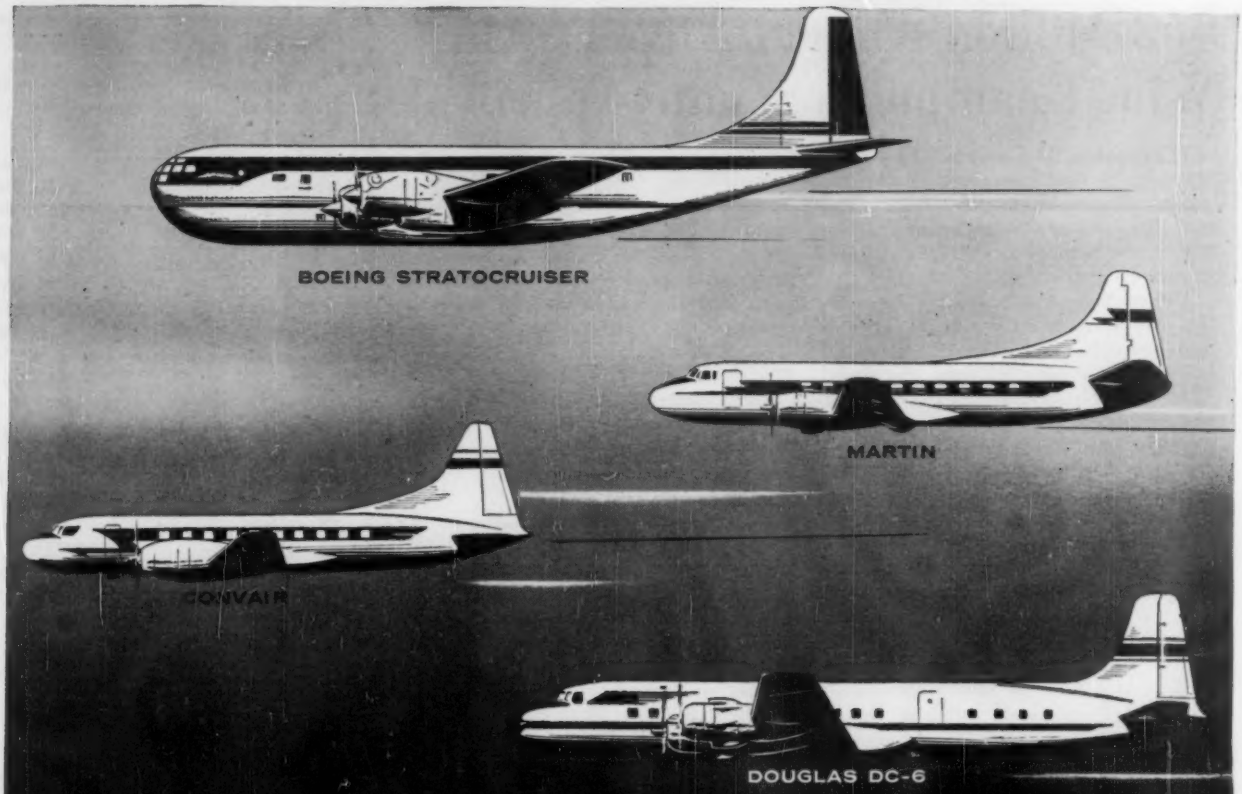
"Then, a strong report found that federal help for airport construction was justified. . . . This fresh declaration rather stimulated things, and for 1955 fiscal year, after no appropriations for Fiscal 1954, the sum of $22 million was appropriated. At that time it was stated that because the program had slowed down during the year that no funds were provided, not as much would be needed for the first year of its reactivation.

"But when we came to the next year with great anticipation of an appropriation, we find that instead of an increase, the Budget Bureau has reduced by one-half the insufficient sum of $22 million appropriated last year—and only $11 million was recommended for Fiscal 1956." (Congress increased this $11 million to $20 million.)

Proposed Airport Aid

This is how the $63 million a year in federal airport aid provided in the Monroney bill would be divided.

State	Amount
Alabama	$836,180
Arizona	939,540
Arkansas	670,938
California	2,734,099
Colorado	955,269
Connecticut	340,256
Delaware	64,980
District of Columbia	120,271
Florida	851,856
Georgia	942,419
Idaho	694,985
Illinois	1,721,651
Indiana	852,738
Iowa	800,327
Kansas	882,263
Kentucky	733,174
Louisiana	760,599
Maine	385,763
Maryland	439,234
Massachusetts	767,262
Michigan	1,654,594
Minnesota	1,072,185
Mississippi	676,053
Missouri	1,096,682
Montana	1,157,301
Nebraska	759,013
Nevada	827,050
New Hampshire	147,216
New Jersey	781,667
New Mexico	985,691
New York	2,606,233
North Carolina	989,458
North Dakota	605,945
Ohio	1,511,101
Oklahoma	841,462
Oregon	932,127
Pennsylvania	1,902,130
Rhode Island	127,157
South Carolina	542,723
South Dakota	657,256
Tennessee	798,404
Texas	3,093,777
Utah	719,824
Vermont	126,216
Virginia	803,025
Washington	863,070
West Virginia	475,132
Wisconsin	993,906
Wyoming	754,789
Total State Grants	45,000,000
Discretionary Funds	15,000,000
Total Funds for Continental United States	60,000,000
Alaska	1,350,000
Hawaii	750,000
Puerto Rico	600,000
Virgin Islands	300,000
Total	3,000,000
Grand Total	$63,000,000



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Court Rules Air Belongs to Public, Voids Local Ban on Low Flying

A Federal District Court ruling last week that air space is part of the public domain checks the threat to airports and airport users of local community regulations banning low flying for take-offs and landings.

The decision, made by Judge Walter Bruchhausen in Brooklyn, ruled unconstitutional a local ordinance of Cedarhurst, L. I., banning low flying air flights below 1,000 feet over the community. The judge permanently enjoined Cedarhurst from enforcing the ordinance. It is the first Federal Court ruling in the country to deal with the issue.

U. S. Attorney Leonard Moore said Judge Bruchhausen's decision would have a far-reaching effect on every airport in the country. He pointed out that numerous other communities near commercial airports have urged similar restrictions. Cedarhurst attorneys said that whether an appeal would be made is to be determined at the next village trustees' meeting on July 11.

Airspace Is Public Domain

The Cedarhurst low flying ordinance was enacted to become effective June 15, 1952, but its enforcement was held up by a temporary injunction. The local law made it a misdemeanor to fly over Cedarhurst at less than 1,000 feet and carried a penalty of $100 fine or six months in jail for violators.

The 10 scheduled airlines using Idlewild, the Port of New York Authority, Civil Aeronautics Administration and the Civil Aeronautics Board filed suit for a permanent injunction against the village. The U. S. Attorney also argued for the injunction in a non-jury trial conducted by Judge Bruchhausen last October.

The findings were issued in a 36-page opinion which upheld the argument that Congress had preempted the air space in passing the Civil Aeronautics Act of 1938. In declaring the Cedarhurst regulation "null and void" and issuing the permanent injunction, Judge Bruchhausen said the ancient doctrine that he who owned the land owned the air above it is no longer valid. He said air space is part of the public domain now.

Use in Pending Cases

Judge Bruchhausen declared that Congress has the power to regulate air traffic in navigable air space and because there have been adopted comprehensive air traffic plans for operations around airports the municipalities have no legal right to establish their own flying regulations. He noted that other courts have upheld the intent of Congress to control the air space.

The opinion declared that the individual states, including such political sub-divisions as Cedarhurst, were precluded from enacting conflicting regulations. Judge Bruchhausen commented that "the fact that various states have legislated in the field of air traffic regulations is no indication that Congress did not intend to preempt the field by the enactment of the 1938 act."

The Brooklyn jurist held that "if other villages and communities adjoining airports should pass similar ordinances, airports for all practical purposes would cease to function." He referred to testimony at the October hearings that with enforcement of the Cedarhurst ordinance there would be substantial restriction of operation of both domestic and international commerce to and from the Idlewild Airport and the possible closing of the airport.

Immediate effect of the decision will be its argument in other pending cases around the country where airports are being sued. Next two leading cases involve airport operations at Pittsburgh and Seattle, where suits have been brought by neighboring residents for trespass and nuisance from aircraft using the field.

CAB ORDERS

(June 16-22)

GRANTED:

Pan American—Grace Airways leave to intervene in the case involving application of Compania Nacional De Turismo Aereo "Cinta Limitada" for a foreign air carrier permit.

U. S. Overseas Airlines an exemption to perform one flight from New York to London and Paris pursuant to a contract with the Brownell Travel Bureau.

Leave to intervene in the Eastern Air Lines route consolidation case to the City of Cincinnati, Board of Aviation Commissioners of Evansville, Ind., and the Evansville Chamber of Commerce.

Leave to intervene in the Trans-Texas permanent certificate case to Eastern Air Lines, American Airlines, Delta Air Lines, Braniff Airways, Continental Air Lines, City of Dallas and the Dallas Chamber of Commerce, City of Fort Worth and the Fort Worth Chamber of Commerce.

H-S Copters, Inc. an exemption to perform irregular air transportation of persons and property with one helicopter within the Second, Third and Fourth Judicial Districts of the Territory of Alaska, for two years.

Seaboard and Western Airlines an exemption to perform one flight from New York to London pursuant to a contract with E. A. Gibson & Co., Ltd., agents for Hunting & Son, Ltd.

U. S. Overseas Airlines an exemption to perform one flight from New York to Shannon, Ireland, Prestwick, Scotland, and Paris pursuant to a contract with the Brownell Travel Bureau.

Transocean Air Lines an exemption to perform one flight from Athens, Greece, to New York pursuant to a contract with the Intergovernmental Committee for European Migration.

APPROVED:

Agreements between certain members of the Independent Military Air Transport Assn. and Air Coach Transport Assn. relating to tenders to the various military agencies.

Applications of Pioneer Airlines and Continental Air Lines for continued suspension of service by American Airlines at Abilene and Big Spring, Tex., and by Continental at Big Spring, until sixty days after decision in the Pioneer certificate renewal case.

An agreement between various members of the Air Traffic Conference of American constituting a tender to be submitted to the military agencies for air transportation of personnel.

AMENDED:

Flying Tiger Line's authorization to perform twenty charter flights in May, June and July. The amendment adds one flight from Munich and Hamburg to New York pursuant to a contract with the Intergovernmental Committee for European Migration, and adds Hamburg and Rome as originating points for the flights that are authorized.

ORDERED:

National Airline's application for renewal of its temporary authority to serve Newport News-Hampton-Warwick be consolidated with the New York-Florida proceeding.

The section of a CAB order which terminated the operating authority of Airline Transport carriers to be herewith rescinded.

Effective date of the amended certificate of Ozark Air Lines be stayed until July 23, 1955 while the Board completes action on a petition for reconsideration.

DISMISSED:

Trans-Pacific Airlines' motion requesting a final mail rate for transportation of surface mail, since there is no plan at the present time for transportation of surface mail by air.

Peninsular Air Transport's application in the New York-Florida proceeding, since the carrier has failed to prosecute the application.

DENIED:

Samoan Airlines' application for authority to operate between American Samoa and Christmas Island and between American Samoa and Honolulu, and South Pacific Air Lines' application for authority to operate between American Samoa and Tahiti and between American Samoa and Christmas Island.

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	1-2	2-3	4+	1-2	2-3	4+	1-2	2-3	4+	1-2	2-3	4+
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DIGITAL DATA HANDLING DEVICES			C			C			C			
MISSILE AND RADAR			M			M			M			
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COMMUNICATIONS			C O						C O			
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COLOR TV TUBES—Electron Optics—Instrumental Analysis—Solid States (Phosphors, High Temperature Phenomena, Photo Sensitive Materials and Glass to Metal Sealing)	L	L	L	L	L	L	L	L	L	L	L	L
RECEIVING TUBES—Circuitry—Life Test and Rating—Tube Testing—Thermionic Emission	H	H	H		H	H		H	H		H	H
SEMI-CONDUCTORS—Transistors—Semi-Conductor Devices	H	H	H				H	H	H			
MICROWAVE TUBES—Tube Development and Manufacture (Traveling Wave—Backward Wave)		H	H		H	H		H	H		H	H
GAS, POWER AND PHOTO TUBES—Photo Sensitive Devices—Glass to Metal Sealing	L	L	L	L	L	L	L	L	L	L	L	L
AVIATION ELECTRONICS—Radar—Computers—Servo Mechanisms—Shock and Vibration—Circuitry—Remote Control—Heat Transfer—Sub-Miniaturization—Automatic Flight—Design for Automation—Transistorization	X	F X	M C F X	X	F X	M C F X	X	F X	M C F X			
RADAR—Circuitry—Antenna Design—Servo Systems—Gear Trains—Intricate Mechanisms—Fire Control	X	F X	M C F X	X	F X	M C F X	X	F X	M C F X			
COMPUTERS—Systems—Advanced Development—Circuitry—Assembly Design—Mechanisms—Programming	C	C F	M C F	C	C F	M C F	C	C F	M C F			
COMMUNICATIONS—Microwave—Aviation—Specialized Military Systems		F	M C F		F	M C F		F	M C F			
RADIO SYSTEMS—HF-VHF—Microwave—Propagation Analysis—Telephone, Telegraph Terminal Equipment		O	O F		O	O F		O	O F			
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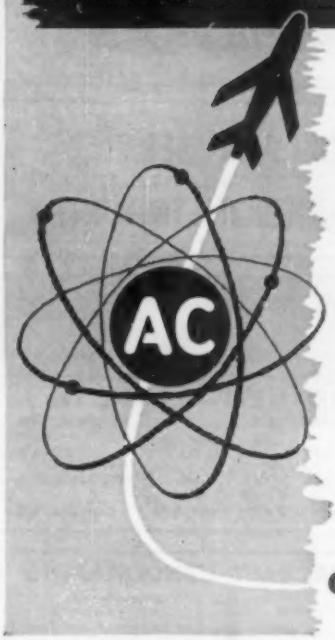

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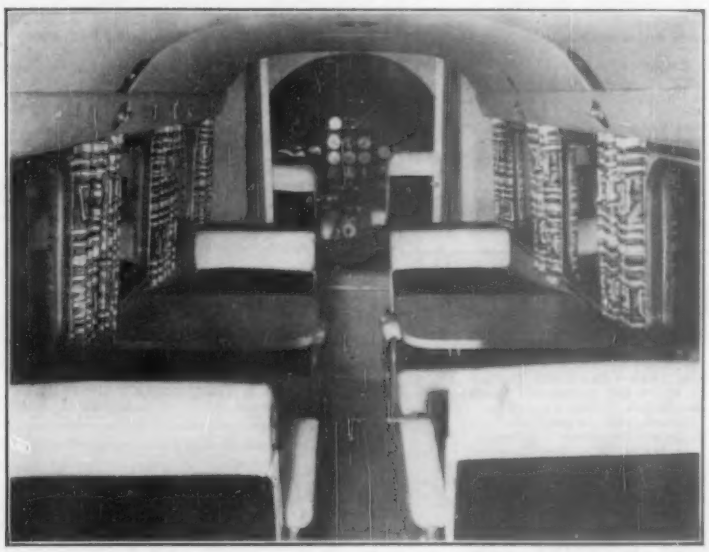

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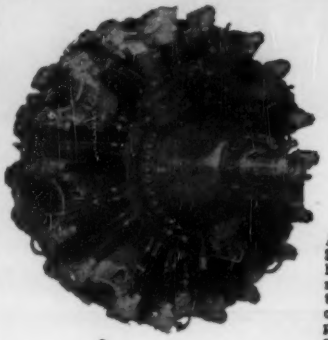

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EDITORIAL

Capital's Viscounts Appear

Capital Airlines will open the gas turbine powered transport era on U. S. airlines this month, beginning scheduled Viscount service between Washington and Chicago on July 26. The whine of compressors and smell of kerosene is destined to replace the popping pistons and blue smoke clouds as the standard sounds and sights on airline ramps around the world.

The fact that the first turbine powered transport to fly under U. S. colors will be British manufactured offers proof that technical progress is the only genuine yardstick for measurement in aviation. Nationalistic pride and restrictions have no place in an endeavor so revolutionary and international as aviation.

"Slim" Carmichael, Capital's president, makes it clear that he picked the Vickers Viscount, powered by Rolls-Royce Dart turboprops, for his 60 plane fleet replacement program for strictly competitive business reasons. Among the key factors in his decision "Slim" Carmichael lists:

- Competition with the Big Four airlines. Carmichael says about 80% of Capital's route structure puts it in direct competition with American, United, TWA and Eastern where Capital has suffered from lack of modern equipment to meet the challenge of these strong competitors. Introduction of the Viscount will give Capital an equipment edge over these competitors for the first time in its history—an edge that will last at least three years until the appearance of the turboprop powered Lockheed Electra.
- Cost feasibility. Cost of the Viscount fleet was within Capital's financing capabilities and was assisted by a profitable sale of Constellations to British Overseas Airways Corp. Capital also expects to save money by standardizing on the Viscount as a replacement for its present assortment of Constellations, DC-4s and DC-3s.
- Timing. Capital could get delivery of the Viscount in 1955 while similar types offered by U. S. manufacturers will not be available until several years later. By getting the Viscount into operation in 1955 Capital will gain a three to four year head start in the turbine powered airline service.
- Passenger appeal. After flying in the Viscount and studying British European Airways experience, Carmichael was convinced that the turboprop transport offered a distinct appeal to the traveling public due to its greatly reduced noise and vibration level. The Viscount is by no means a noiseless or vibrationless aircraft. Nor is there ever likely to be such an airplane. But the Viscount is noticeably more comfortable riding than a piston-powered transport.

The Viscount already has proved to be a formidable competitor to piston powered transports in Europe, in Australia and now in North America where Trans Canada is boosting its share of the Toronto-New York traffic with the Vickers aircraft. Capital's traffic figures on the highly competitive Washington-Chicago route after the Viscount gets into service should be interesting.

Capital Airlines has grown and prospered under "Slim" Carmichael's stewardship. It will be interesting to see whether the Viscount fleet replacement program he initiated will prove to be another significant step in the increasing stature and prosperity of Capital among the domestic airlines.

Atlantic Travel Boom

Pan American World Airways' completion of its 50,000th trans-Atlantic crossing on June 28 highlights two major facts in this area.

First, the fantastic progress that has been made in linking Europe and North America by air, since Pan American pioneered the first scheduled passenger service across the Atlantic in Boeing flying boats 16 years ago.

Second, the tremendous air travel boom now in progress across the Atlantic that will certainly set new traffic records for both coach and first class travel.

Compared with the twice weekly flying boat service that often took 24 hours from Newfoundland to Europe in 1939, Pan American now dispatches 116 flights weekly to Europe in Boeing Stratocruisers and Douglas DC-6s and DC-7Bs that can fly nonstop to London in 12 to 14 hours. During the last week in June 569 U. S. and foreign aircraft arrived from, or departed for, Europe at Idlewild Airport alone.

For the second straight year airlines will carry more people to Europe than steamships. Last year's record of 580,000 trans-Atlantic airline passengers seems certain to be boosted by at least 10% this year.

More Moscow Air Shows

Although the major air display celebrating Red Air Force Day failed to appear over Moscow on June 19 as predicted to AVIATION WEEK by three Russian air engineering officers attending the recent Canadian International Air Show (AW, June 13 p. 15), the sky over the Soviet capital has been filled with modern jet aircraft almost daily in recent weeks. Stewart Alsop, reporting from Moscow, noted between 150 and 200 turboprop bombers, turbojet bombers and turbojet fighters in the air on the day of the official reception for Indian Prime Minister Nehru. The younger Alsop brother also reported that formation flights of Russian jet planes have become a daily routine over Moscow, usually around 11 am. or 4 pm. He also reports the Red Air Force celebration is now believed to be scheduled for a Sunday in July.

Despite these daily exhibits of the latest Russian aircraft over Moscow, the Department of Defense refuses to release pictures of these planes taken during public displays so that the American people, too, can see them. How much longer will this farce continue?

—Robert Hotz

Inaugurating the New Super-7 Clipper Service

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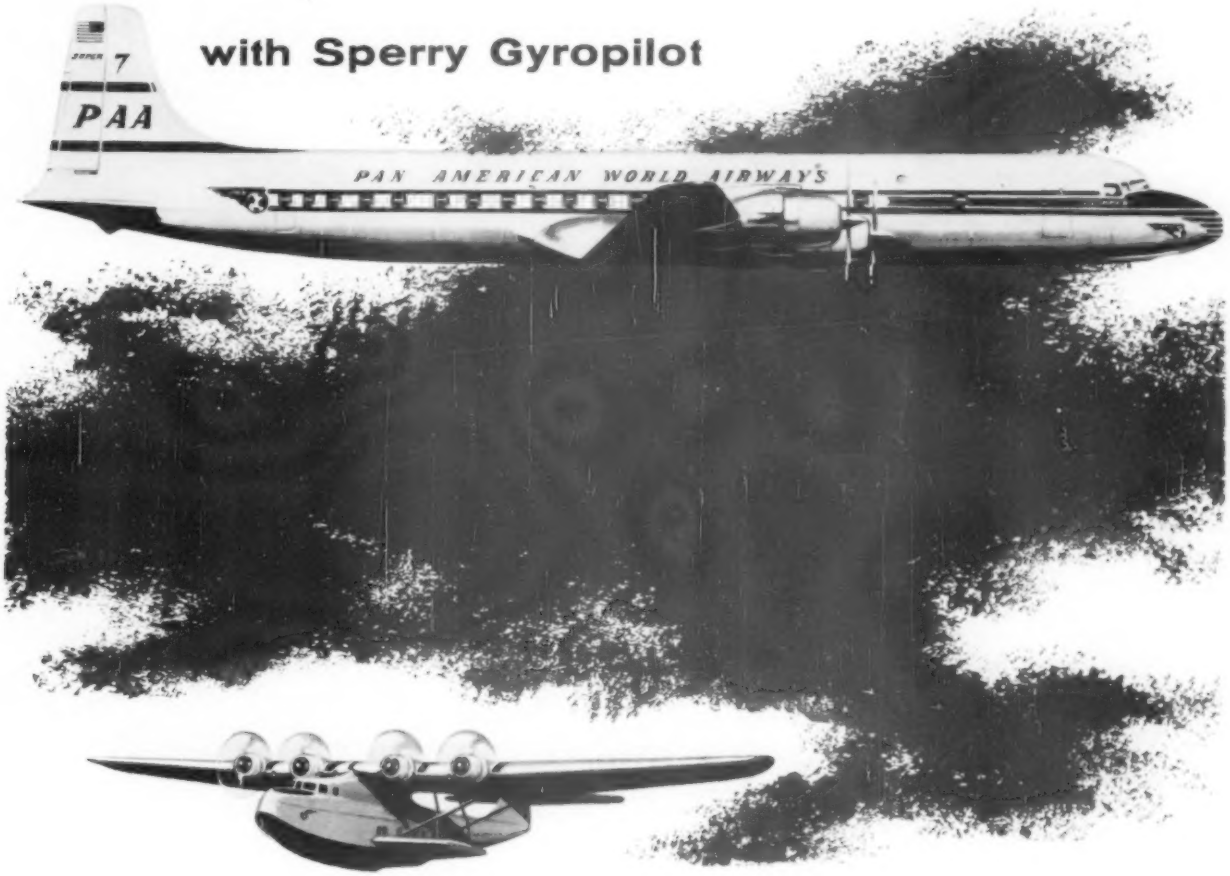

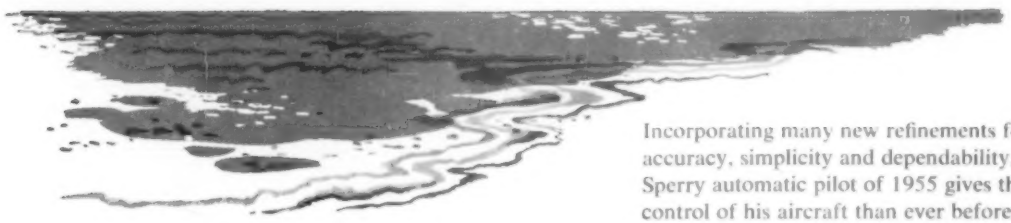

Flying with Pan American World Airways is nothing new for Sperry! On November 22, 1935, Sperry Gyropilots* helped Pan Am blaze the way for the first Pacific crossing on the "China Clipper."* And from the beginning of its trans-Atlantic service in 1939, Sperry Gyropilots have been standard equipment.

Now, 150,000,000 miles and 50,000 trans-Atlantic crossings later, Pan Am again chooses Sperry Gyropilots for the luxurious new Super-7 Clippers.*

Incorporating many new refinements for increased accuracy, simplicity and dependability, the Sperry automatic pilot of 1955 gives the pilot more precise control of his aircraft than ever before. Used alone, or in connection with the new Sperry Radio Beam Coupler, the Sperry Gyropilot, besides giving the pilot a dependable, trustworthy assistant, gives the passenger a smoother, more comfortable ride and the airline operator greater efficiency and economy.

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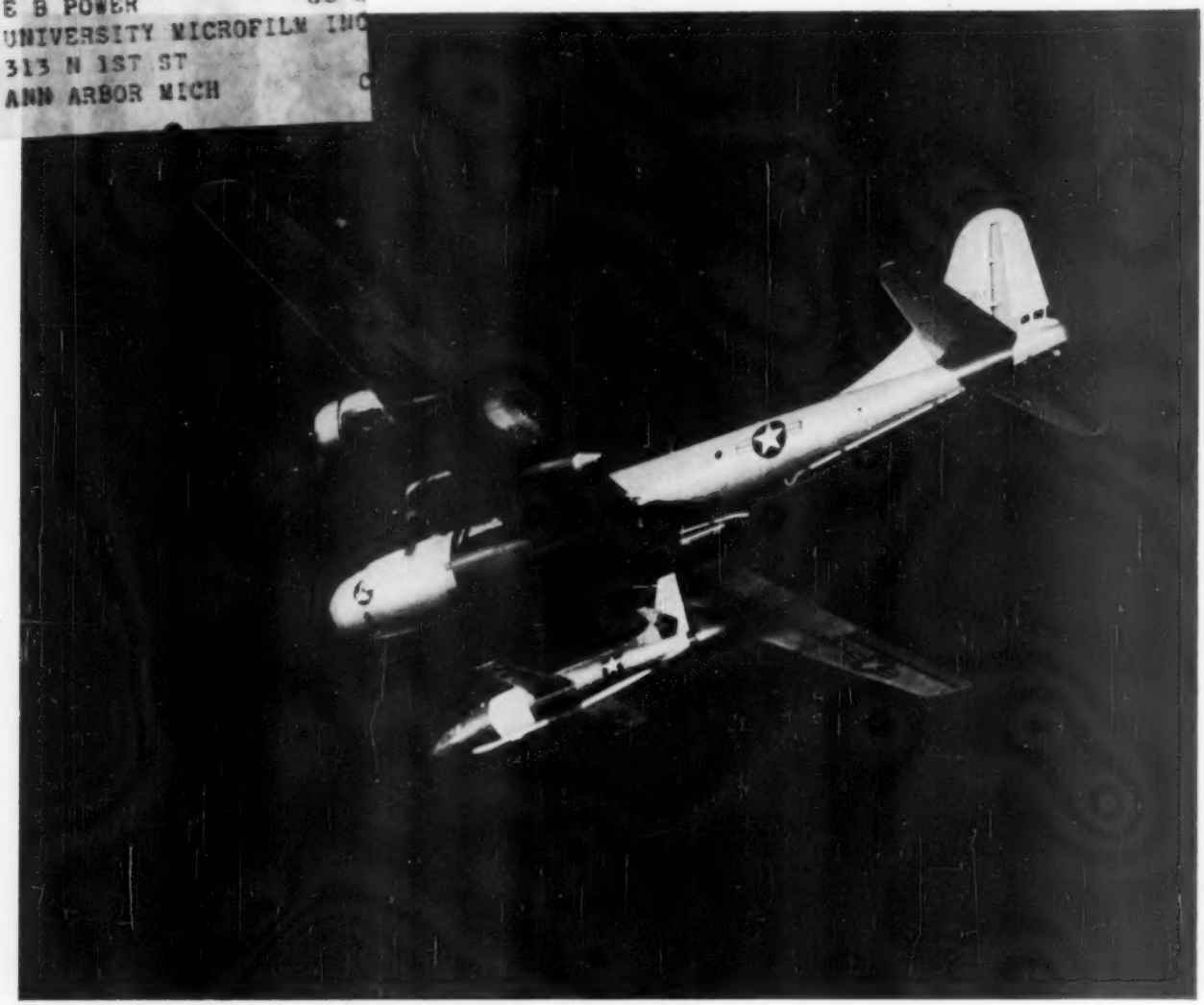

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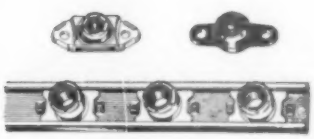
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